

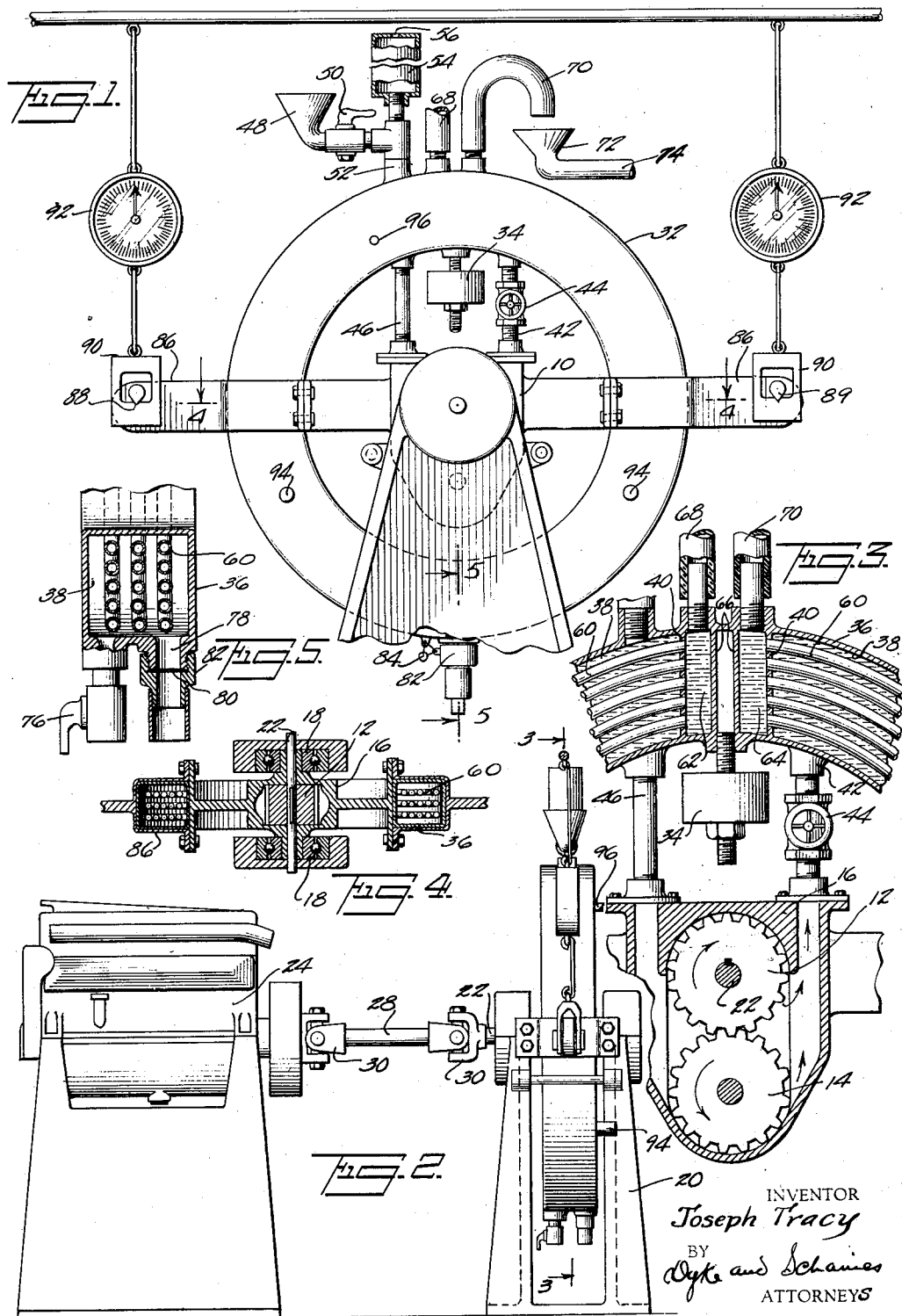
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J. TRACY

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BALANCED FLUID DYNAMOMETER

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UNITED STATES PATENT OFFICE

JOSEPH TRACY, OF RUTHERFORD, NEW JERSEY

BALANCED FLUID DYNAMOMETER

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My invention relates to a balanced fluid dynamometer, and will be best understood from a description of the embodiment shown in the accompanying drawings, in which:

5 Fig. 1 is an end elevational view, with parts broken away, of a dynamometer embodying my invention.

Fig. 2 is a side elevational view showing an internal combustion engine connected up with 10 the dynamometer shown in Fig. 1.

Fig. 3 is a vertical section taken on approximately the line 3—3, Fig. 2.

Fig. 4 is a section taken approximately on the line 4—4, Fig. 1, and

15 Fig. 5 is a section taken approximately on the line 5—5, Fig. 1.

Reference character 10 is applied to designate generally a pump. The pump shown is of the rotary gear pump type, comprising 20 gears 12 and 14 turning in the casing 16.

Casing 16 and appurtenant parts hereinafter referred to are mounted to turn (oscillate) on anti-friction bearings 18 on an axis coincident with the axis of shaft 22 of gear 25 12. The device being tested, such as an internal combustion engine 24, for example, is connected to shaft 22 as by means of a shaft 28 and universal joints 30—30.

The cooler 32 is carried by the pump casing 16 and turns therewith. An adjustable counter-weight 34 is provided for the purpose of balancing the pump casing, parts carried thereby and contents thereof with respect to the axis of oscillation.

35 In order to facilitate the balancing of the pump and cooler assembly, the cooler 32 is preferably of annular formation, with its center in the axis of pump casing 16. In the form shown, the cooler 32 comprises an annular hollow casing 36 containing a chamber 40 38 which is continuous except for interruption at one portion, preferably the upper portion thereof, which part of the chamber 38 is partitioned off, as by the tube-plates 40—40.

45 The adjacent, but separated ends of chamber 38 are connected to pump 10 so that fluid, as oil, pumped by pump 10 will be circulated through chamber 38 and back to the pump. With the construction shown, and adapted 50 for rotation of gears 12 and 14 by the power

device in the directions shown by the arrows on Fig. 3, the outlet pipe 42 from the pump 10 is the inlet pipe to chamber 38, and is controlled by a valve 44, while the pipe 46 is the outlet pipe from casing 38 and inlet pipe 55 to pump 10, and as shown, pipe 46 is without a control valve. As will be readily understood, the piping and valving for the circulating medium can be reversed in case the pump is rotated in the opposite direction from that indicated on the drawings, in which case 60 the water circulation would preferably be reversed and the filling and expansion devices be put on the return side. Both outer and inner pipes can be valved, if desired. 65 The torque arm arrangement hereinafter referred to is shown as adapted for either or both of the cases just referred to.

A funnel 48 and cock 50 are provided for filling chamber 38 with the oil or other circulating fluid. Funnel 48 limits the height 70 up to which oil can be brought in filling by extra oil running over the funnel top. The oil filling pipe 52 has an expansion oil chamber 54 connected thereto and provided with 75 a vent or vents 56 at its upper end.

To conduct away the heat of the oil or other liquid which is circulated through the pump and through chamber 38, and which liquid is heated, as by friction or by being forcibly 80 driven through the control valve 44 when the latter is partially closed, the tube plates 40 are fitted with the approximately circularly bent tubes 60, which provide for passage, 85 throughout the chamber 38 of cooling fluid, preferably water. The water inlet and exit chambers 62 and 64 are separated, as by a partition or partitions 66 and serve for supply and discharge of cooling water. The 90 water is supplied from a source of pressure, as by means of a flexible hose 68 and is preferably discharged through the exit spout 70 into a funnel 72 and run off through pipe 74. In this way but one flexible hose connection 95 to the apparatus is required. A draw-off cock 76 may be provided for draining chamber 38. It will be seen that with the construction described, the oil and water travel in opposite directions, and this relation is best adapted 100 to secure adequate cooling.

Safety means are preferably provided for preventing damage to the apparatus by over heating of the oil being circulated through the pump and cooler. In the form shown, an auxiliary oil outlet spout 78 is provided which is normally closed by the disk 80, of fusible metal, the fusing temperature of the metal being chosen so that same will melt and permit the discharge of the oil should the temperature of the latter exceed the permissible maximum. The fusible disk 80 is preferably clamped in place by the coupling 82, so that it can be quickly replaced after being melted in use. To prevent tampering with the safety device just described, I preferably seal the coupling 82 in place by means of a seal 84. Whether or not replacements of the fusible disk 80 have been made will immediately be made apparent by inspection of seal 84.

The torque arm or arms 86 are provided to turn with the pump casing and cooler. I prefer to provide two torque arms 86 arranged symmetrically at each side of the apparatus and having knife edges 88, 89, which are preferably normally in horizontal alignment with the axis of oscillation. In the form shown, the knife edges coact with the links 90, 90 attached to spring balances 92, 92, but platform or beam scales or other suitable weighing mechanisms may be used.

Stop means are provided to limit the turning movement of the pump housing and connected parts, as, for example, lugs 94 on the cooler casing, and which limits the turning movement by engagement with a pedestal. A thermometer 96 is provided for indicating the temperature of the circulating oil and is preferably inserted in the neighborhood of the entrance to the oil return tube 46.

Various changes may be made within the scope of my invention, as, for example, various forms and arrangements of oil and water circulating passages within the cooler may be used.

I claim:

1. In a dynamometer, a pivoted pump, a cooler mounted to oscillate with the pump on its axis of oscillation, the oscillatable assembly being in rotational balance.

2. In a fluid dynamometer, a pump, a cooler rigidly secured to the pump, said pump and said cooler being oscillatable about an axis with respect to which the weights of the oscillatable part of the apparatus are in rotational balance.

3. In a dynamometer, a pump mounted to turn on an axis, and a substantially circular cooler extending around the pump, whereby the pump and the cooler may be substantially balanced with respect to the axis of oscillation.

4. In a fluid dynamometer, a pump, a substantially circular receptacle for fluid circulated by the pump attached to the pump, and said pump and attached receptacle being in

rotational balance and mounted for oscillation about an axis, and means for cooling the fluid in said receptacle.

5. In a fluid dynamometer, a pump mounted to pivot on an axis, a receptacle for fluid circulated by the pump attached thereto, said pump and attached receptacle and contents being in rotational balance, a valve for controlling the circulation of the fluid, and means for cooling the fluid in said receptacle.

6. In a fluid dynamometer, a pump, a receptacle for fluid circulated by the pump, and a fusible member adapted to permit escape of the fluid upon undue rise of the temperature thereof.

7. In a fluid dynamometer, a pump, a substantially circular receptacle for fluid circulated by the pump attached to the pump, the pump, receptacle and contents being adapted to oscillate about an axis, and a counterweight for putting the pump, attached parts and contents into rotational balance.

8. In a fluid dynamometer, a gear pump mounted to oscillate on the axis of a gear thereof, a circular tank surrounding the pump and supported thereon and connected thereto by piping so that fluid is circulated through the tank and back to the pump, a valve in the pump outlet passage for controlling the fluid circulation, pipes for cooling water in said circular tank, and means for circulating water through said pipes to travel in the opposite direction from the travel of said fluid.

9. In a fluid dynamometer, a gear pump mounted to oscillate on an axis coincident with the axis of one of the pump gears, a substantially circular container for oil circulated by said pump, said container being carried by the pump, and the pump, container and contents being in rotational balance, the oil chamber in said container being interrupted at a point substantially over the pump axis, substantially circular pipes for cooling water extending through the oil chamber and provided with inlet and outlet headers, a flexible water supply pipe connected to the water inlet header, a water outlet conduit connected to the water outlet header and turning freely with the pump and container, and stationary means for collecting and taking away the water discharged through said conduit.

In testimony whereof, I have signed my name hereto.

JOSEPH TRACY.