Migration of Fish.

Dr. Keller, in a communication sent to the Swiss Geographical Society, from Suez, gives some interesting points on this subject. In the twelve years that have elapsed since the opening of the Suez Canal, the interchange of animal life between the Mediterranean Sea and the Indian Ocean has not reached the dimensions at first anticipated, still a number of smaller fish have found their way from the Mediterranean to the Red Sea. A greater desire to travel in this direction than in the opposite one seems to prevail. A very interesting fact has, however, been established, namely, that the real pearl oyster are traveling through the canal, not a few straggling outposts, but large trains moving regularly along. As they have not yet reached the Timsah lake, it will be one or two decades before they will be established in the Mediterranean.

THE BINARY INJECTOR.

The accompanying engraving illustrates a somewhat curious injector made by Messrs. Weild & Co., Gorebrook Ironworks, Longsight, Manchester. It was for a long time a puzzle how an injector working under a given pressure could force water into a boiler in which there was a still greater pressure, but the Binary injector does more than this, for the exhaust steam from an engine is made use of to feed the boiler with water.

The section which we give will make the interior of the instrument intelligible. The theory of the action of the injector we give as stated by Messrs. Weild. The injector is not perceptibly intermittent in its action, although the exhaust from the engine comes in puffs. The pressure of the steam cannot be less than about 18 lb. absolute, and this, coming in contact with the feed, is condensed, and the velocity of influx of the steam to the injector is thus very high.

Between the blasts or puffs the reciprocation of the piston expels the residual steam or vapor, which must, in the cylinder of a non-condensing engine open to the exhaust, necessarily equal the atmospheric tension. The continual supply and condensation of such steam provides, without intermission, a propulsive energy sufficient to introduce the feed-water under ordinary pressures, as we conceive the following rough calculation will tend to show. Friction neglected, steam of 14·7 lb. per square inch, or 2,118·4 lb. per square foot, absolute pressure, will flow into a vacuum of 10 lb. per square inch below the atmosphere, which corresponds to an absolute pressure of 4·7 lb. per square inch, or 676·8 lb. per square foot, with a velocity

$$=8\sqrt{\frac{2118\cdot4-676\cdot8}{0\cdot0378}}$$

$=1{,}554\cdot8$ ft. per sec.

The head of water requisite to balance a pressure of 75 lb. per square inch above atmosphere

$=75\times2\cdot25=169$ ft.

nearly. Velocity of efflux under such head

$=8\sqrt{169}=104$ ft.

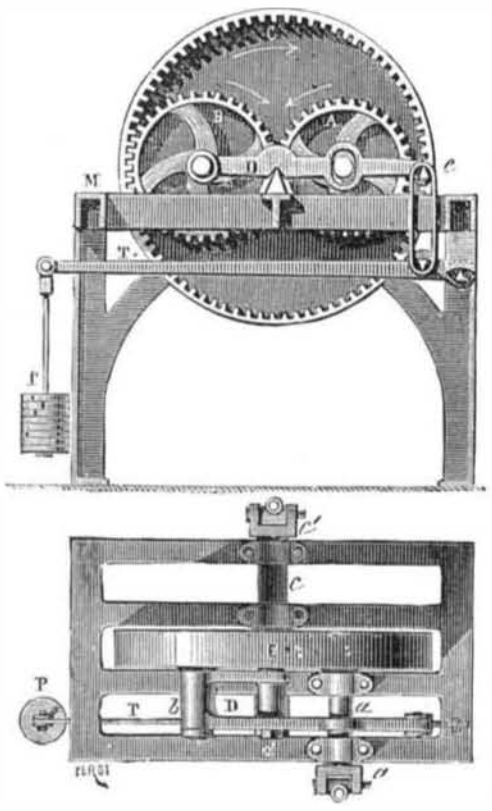
per sec. Suppose each pound weight of steam of atmospheric tension propels 12 lb. of water and is thereby condensed, the equivalent resultant velocity will be $\frac{1{,}554\cdot8}{113}=119$ ft. per sec.; this is equal to a head of 219 ft., or a pressure of 97·5 lb. per square inch. If the original temperature of the water be 50°, the resultant heat at which the feed leaves the injector will approximate 149°. The injector has been doing excellent work wherever it has been fitted.

New Jersey Glass Blowers.

According to a table compiled from replies to a letter of inquiry sent by the New Jersey Labor Bureau to the glass blowers at home and abroad, the average yearly earnings of glassblowers in New Jersey is from $1,064 to $1,080 per annum according to the kind of work done. One glass-blower, who lost twenty days during the year, reports that he received $1,350 in wages. An English workman on the same kind of goods reports his income for the year at £120, or about $583. His hours of employment ranged from eight in the slack to ten during the busy season; that of the American workman from eight and a half to nine hours per day.

RAFFARD'S TRANSMISSION DYNAMOMETER.

The annexed cut represents a new transmission dynamometer, that is to say, an apparatus for measuring the power expended by machine tools. The motor acts directly upon the axle of the wheel, A, in the direction shown by the arrow, and this wheel carries along the intermediate one, B,



RAFFARD'S TRANSMISSION DYNAMOMETER.

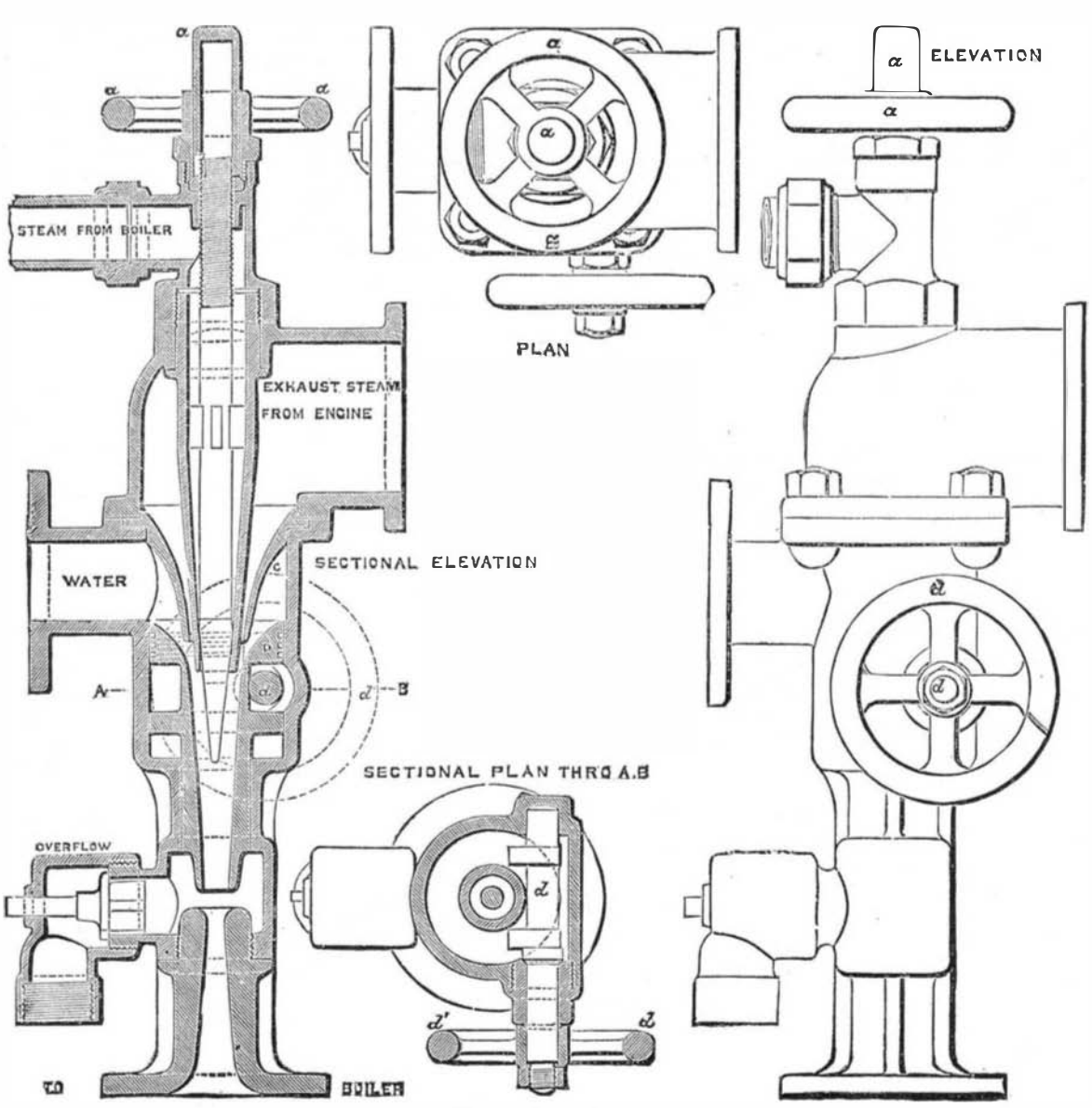
which transmits motion to the inner-toothed wheel, C. The latter is connected with the tool to be experimented upon by the axle, c, and the Cardan joint, c'. The axles, a' and c', revolve in bearings fixed to the frame, M, but the axle of the wheel, B, revolves in a bush which is carried by a beam whose fixed axis passes exactly through the contact of the primitive circumferences of the wheels, A and B. The result of this is, that the momentum of the force exerted by the wheel, A, upon B, is null with respect to the edge of the knife-blade upon which the beam oscillates, and that, consequently, such force has no tendency to move the beam in one direction more than in another. The beam, then, is only influenced by the resistance that the wheel, C, offers to the motion of the wheel, B; and it is such resistance that, by a system of levers in a ratio of 1 to 10, is measured by means of the weight, P.

In order to simplify calculations the primitive circumference of the wheel, C, is made equal to 3 meters. The formula of the work then becomes very simple: $T=\frac{P\times10\times3\times n}{60}=\frac{P\,n}{2}$, in which T is the work per second, P the weight situated at the extremity of the lever system, and n the number of revolutions per minute.

It should be remarked that this dynamometer will permit of obtaining results that are not very far short of the truth; since, save the friction of the wheel, C, all the friction of the apparatus is external to the measurement. Now, the force which acts on the wheel, C, being transmitted in a direction opposite the gravity, the friction due to the weight of this wheel need not be taken into account. There only remains the friction of the teeth; but it is well known that wheels with inner teeth, especially when they are governed by a relatively large pinion, occasion very little friction.

If the causes of error of this new dynamometer be compared with those that exist in the White apparatus employed in the United States, it will be found that they are about four to five less.

By substituting a spring for the weight, P, any kind of a totalizer may be applied to the new apparatus.



THE BINARY INJECTOR.

The Return of the Rodgers Crew.

The Revenue steamer Corwin, which was sent to the relief of the officers and crew of the Rodgers (burned last winter in St. Lawrence Bay, Siberia), found on her arrival at the bay that the party had already been picked up by the steam whaler North Star. There were five officers and twenty-six men, all in fairly good health. They were transferred to the Corwin, which returned to San Francisco, arriving June 23. The commander of the Rodgers, Lieutenant R. M. Berry, with Ensign Hunt, were not with the party, having left St. Lawrence Bay, December 23, on a sledging search along the Siberian coast for the survivors of the Jeannette. At last report, April 4, Lieutenant Berry had arrived at Kolyma River, about half way between St. Lawrence and the Lena River.

On the 4th of February Master C. F. Putnam, commanding the supply depot at Cape Serdze Kamen, arrived at the native village where the Rodgers people had found refuge, with four sledges loaded with pemmican and other provisions for the party, he having heard of the loss of the ship through natives. He started on his return trip to the depot in bad weather, and was overtaken by a terrible gale of wind, with drifting snow, when two days out, and was obliged to turn back, and in his endeavor to reach the village on the southern side of St. Lawrence Bay, about twelve miles from North Head, he became separated from his native escort, and, not being able to see ten feet ahead of him, was carried out to sea on an ice floe. Later in the day he was seen about seven miles off shore, abreast of the village. A vigorous attempt was made to rescue him by four of the Rodgers crew and two natives in a canoe, but owing to the intervening ice they were unable to reach him. He was not seen afterwards. Search was made along the coast; four of his dogs were found, but no vestige of the unfortunate officer.

In a report to the Secretary of the Navy, sent forward by W. H. Gilder, Lieutenant Berry describes the burning of the ship, November 30. He was unable to determine the origin of the fire, but thought it most probable that it was caused by the heat from the donkey boiler, charring and firing the deck underneath. The records of the expedition were saved.

THE coast of Louisiana abounds in oyster banks, and a considerable oyster trade has been developed at New Orleans, giving employment to about 200 luggers, each manned by from three to six men.