A SUGGESTION IN CANAL BOAT PROPULSION.

A paper which excited much attention was read at the last meeting of the British Association for the Advancement of Science, by H. C. Vogt. It is published in full in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 670. It was devoted to the subject of the propulsion of ships by air propellers. In it Mr. Vogt gave the summary and results of some very remarkable trials in navigation, executed at Copenhagen. A steam launch was fitted with a windmill with steel blades. It was carried on a frame above the deck, and formed an aerial propeller wheel. Steam machinery was provided for rotating this. With this as a propeller, it was proposed to drive the boat. At first sight the method would seem an extremely inefficient one as regards application of power to so unstable a medium as air. But when it is remembered that recent investigations of the marine propeller have established it as a true reaction engine, in which a large slip is not necessarily an accompaniment of inefficiency, it will appear clear that there is nothing wrong in the principle indicated by Mr. Vogt. An air propeller is a pure momentum or reaction machine. Practically, it was found that a twenty foot launch of five and one-half feet beam, with a propeller eight and one-half feet in diameter, could be driven at a speed of five knots per hour in calm weather and against a fresh breeze at four knots. The engine producing this effect indicated one and one-half horse power. For a single indicated horse power the thrust of the propeller was 36·7 pounds or about the same as that of a water propeller. It might be supposed that in a contrary wind this thrust would disappear, but, on the contrary, through seventy-five per cent of the horizon the thrust was found to be augmented by the wind.

With a larger launch, having a displacement of five tons, a speed of over six knots an hour was obtained against the wind. In some of the trials canvas-covered wings were used, but were found inferior to the steel ones.

We illustrate in the cut accompanying this article a suggestion in the direction of canal boat propulsion. A barge is provided with one of these aerial propellers carried well above the deck on standards. To actuate the propeller a dynamo is provided which is carried on the top of the frame and is connected by gearing with the propeller shaft. In this place frictional cone gearing might be advantageously adopted, so as to admit of a variation of speed. The blades of the propeller should be of steel accurately shaped and arranged to be turned at greater or less angles according to the direction of the wind. To drive the dynamo, a lead of an electric circuit is carried along the bank, upon which line runs a trolly. Wires extend from the trolly to the dynamo, or the circuit may be completed through the earth, the body of water in the canal offering the best possible facilities for grounding the motor circuit. Thus equipped, a canal boat could make her way with a speed exceeding that generally used, and with no greater proportionate expenditure of power than that existing in all cases where the trolly system of actuating electric motors is in use.

The advantages of the system are obvious. The hull of the vessel would be entirely clear of machinery, and the entire weight of the propelling apparatus carried by the boat need not greatly exceed that of an ordinary tow rope. No disturbance of the water of the canal would be produced, except such as would be due to the progressive motion of the hull of the vessel. It would seem as though in this suggestion might be found a solution of the mechanical driving of canal boats; one that from the points of view of simplicity, non-occupancy of the hull of the boat, and minimum disturbance of the water, would be nearly perfect.

The air propeller works with an entire absence of vibration. It requires ten or twelve times the area of the corresponding water screw. The blades may for the first reason be carried out to the tips of increasing width. As the thrust is a perfectly quiet one, and if due to the motion derived from a dynamo would be free from the jarring inseparable from the motions of a heavy reciprocating engine, and as it is cushioned in all its motions by the high elasticity and mobility of the air, a very light frame would suffice to carry the wheel. The thrust of seventy-five to one hundred and fifty pounds would be all that the frame would have to resist—a thrust which would always be brought upon it gradually and would be gradually released. In steam canal boats a very considerable portion of the hull is occupied by the engine, boiler, and coal bunkers, while the constant eddies and currents produced by the propeller are destructive in their effects on the sides and bottom. This is all done away with in the aerial propulsion. The establishment of a line of poles and wire would not represent the tithe of the cost of a fixed or traveling towing cable.

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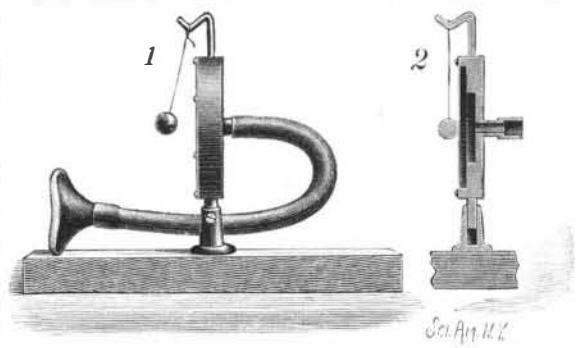
VIBRATIONS OF DIAPHRAGMS.

BY GEO. M. HOPKINS.

The telephone and phonograph show conclusively that the human voice is able to set certain bodies in



EXPERIMENT SHOWING THE VIBRATION OF A DIAPHRAGM.

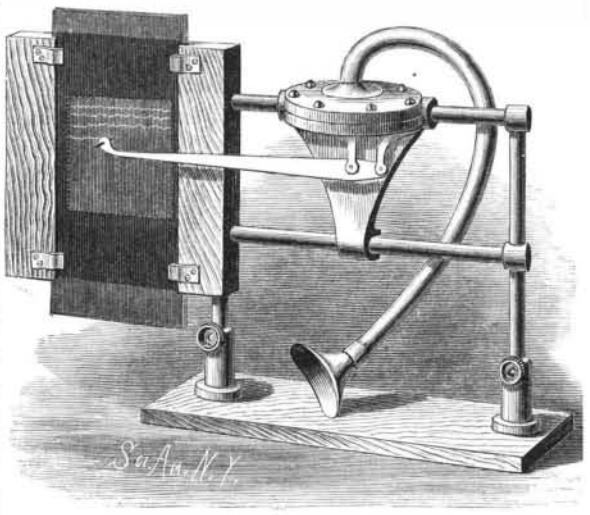


Fig. 3.—PHONOGRAPHIC RECORDER.

active vibration. These vibrations may be detected by touch, but they are not discernible by the unaided eye. It has been shown that the force which produces them is able to perform a considerable amount of work. A telephone diaphragm is able to vibrate sufficiently to transmit speech, even when heavily weighted. A diaphragm, when placed in a horizontal position and damped by a five pound weight suspended from its center, transmitted speech equally as well as one not so damped, the only difference being a considerable loss in the volume of sound.

Mr. Edison some years since devised a piece of apparatus known as the motophone, in which a diaphragm vibrated by the voice was made to rotate a wheel at a high velocity. In the phonograph the cutting stylus, which is moved by the diaphragm, exhibits, when in action, something of the power of the voice, and the engraving on the cylinder of the phonograph shows the complex character of the vibrations of the diaphragm, but on so small a scale as to be difficult of observation.

The use of the apparatus shown in the annexed engravings is, first, to show by means of the lantern that the telephone diaphragm vibrates, and, second, to exhibit by the same means the character of the vibrations.

In Fig. 1 is shown a telephone diaphragm arranged upon a standard and adapted for projection. This apparatus is shown in section in Fig. 2. To the top of the diaphragm cell is secured a hook which supports a small metallic ball opposite the center of the diaphragm by means of a fine silk thread. The ball hangs normally in contact with the diaphragm, but when sounds are uttered in the tube attached to the cell, the diaphragm is vibrated, its motion being made manifest by the repeated repulsion of the ball.

In Fig. 3 is shown an instrument for tracing upon a smoked glass a record of the movements of the diaphragm. A wooden frame is supported by a standard secured to the base board. The face of the wooden frame is grooved to receive the smoked glass plate, which is held in the groove by four spring clips, so that it may be moved up or down after each tracing, preparatory to making a new one. In one edge of the frame are inserted two parallel rods, which are further supported by a standard attached to the base. The standards are made adjustable to adapt the instrument to lanterns of different heights. The arm which supports the diaphragm cell is provided with a sleeve which slides freely on the upper rod, and it is furnished at its lower end with a fork which partly embraces the lower rod. By this arrangement, the diaphragm cell is truly guided while the tracing is being made, and at the same time the construction allows of tilting the cell whenever it is desirable to remove the tracing point from the surface of the glass. The diaphragm cell consists of two chambered recessed disks fastened together with screws, and clamping between them a thin iron diaphragm. The upper disk is apertured and provided with a flexible tube terminating in a mouthpiece. To the center of the diaphragm is attached a stud, which is pivoted to the tracing lever, the lever being fulcrumed in a rigid arm projecting downward from the cell. The free end of the tracing lever carries a fine cambric needle, which lightly touches the surface of the smoked glass when the cell is in the position shown. The tracing lever is made of a thin bar of aluminum, which can spring laterally, but which is very rigid in the direction of its motion.

When used, the apparatus is placed with reference to the lantern so that the opening of the wooden frame will come within the cone of light in front of the condenser. The smoked glass is focused on the screen, the diaphragm cell is placed near the wooden frame and held in one hand, while the mouthpiece at the end of the flexible tube is held at the mouth by the other hand. Now, while a sound is made in the mouthpiece, the diaphragm cell is quickly but steadily drawn along, so as to cause the tracing needle to traverse the smoked glass. A sinuous line will be formed upon the glass, which will be characteristic of the sound uttered, and this line will appear upon the screen as it is formed. By tilting the diaphragm cell, and moving the smoked glass, and then returning the cell to the point of starting, the operation may be repeated. It will thus be seen that, by means of this instrument, a sound may be produced and analyzed at the same moment.

MOSS MARBLE.—There has been discovered, four miles south of Rattlesnake Springs, Washington Territory, an extensive ledge of marble, in which beautiful trees or plants of moss are as frequent and as clearly defined as in the moss agate, though the marble is not translucent. The body of the stone is mostly white, with splotches of pink and blue between the bunches of moss.