

THE SILVERTOWN DYNAMO.

THE dynamo which we illustrate is of special interest as having been built to satisfy the Admiralty requirements with regard to heating. The machine is of the ordinary Gramme type, with inverted single horseshoe magnet, and, by the courtesy of the manufacturers, the India Rubber, Gutta Percha and Telegraph Works Company, Limited, we are able to give herewith some of its leading details. The machine shown in our illustration is intended for belt driving, but it will be easily understood that, by replacing the pulley by a coupling, and prolonging the bed plate, this machine can be directly coupled to a Willans engine, and it is this combination which has been supplied to the Admiralty. The armature core consists of naked iron wire thirty-one milles diameter, supported on a metal spider. The core is wound on a special lathe, in which

shunt winding is 11,400 ampere turns. The series winding consists of copper strip $\frac{3}{4}$ in. by $\frac{1}{4}$ in. wide, there being fourteen turns on each limb. The resistance of the series coils is 0.006 ohm, and the exciting power of 5,712 ampere turns. This gives a total exciting power of 17,112 ampere turns. The machine is intended for an output of 200 amperes at 80 volts terminal pressure when running at 460 revolutions per minute.—*Industries.*

PHOTO-LITHOGRAPHIC TRANSFERS.

By W. T. WILKINSON.

THERE are various ways of making photo-transfers, viz., upon paper direct and upon zinc, for subsequent retransfer to stone. The direct method is that most generally used, and for rough, ordinary work answers

sensitized and developed in the same way, yield very good transfers.

Winstone, Shoe Lane, London, sells Husnik's transfer paper, which is sensitized in potassium bichromate dissolved in a mixture of water and methylated spirits of wine. This paper is inked up dry and developed in cold water. This paper is made by first coating with gelatine and chrome alum, drying, then floating upon albumen, which requires the methylated spirit to coagulate it and prevent its removal during sensitizing.

Bank post paper is usually recommended for photo-litho work, but it is too thin. The best paper is good wove, not laid, paper, from twenty-five to forty pounds per ream.

Inking up the Prints.—The old plan of inking up the prints involves the use of a litho-press in the dark room, and is at its best a clumsy and wasteful way of doing the work. The easiest and best way is to use a board like the back of a printing frame, one portion to be say 12x3 and the other 12x15, hinged together; the hinges to be sunk in the wood so that when the board is laid on the table it will lie quite flat. To use this board, raise the board in the middle, insert the edge of transfer in the joint, and the pressure at the hinges will hold it tight. Now on a clean inking slab thin a little photo-litho transfer ink with turpentine, charge a glue and treacle roller, then ink up the print, rolling from the hinges only, continuing the rolling until the turpentine has evaporated, when there should be a thin, even coat of ink, through which the image can be faintly seen. One of the points upon which a beginner stumbles is the inking up of dry transfers—the usual plan being to crowd on as much ink as possible, the consequence being that the print smears in development.

In inking up a wet transfer, place a piece of thick blotting paper on the board. Place the wet transfer upon it face up, fix in the joint, blot the surface with either blotting paper or a soft cloth. Then having charged the glue roller with thin ink, roll the print one way only until the whites clear, leaving the lines forming the image standing out firm and black. A gentle rub with a pledget of cotton wool well charged with water will remove any seum left on whites, and the transfer is hung up to dry.

Photo-litho transfers should be dried at as low a temperature as is possible, else the gelatine coat will be made brittle, and the ink made too dry to give a solid transfer. For photo-litho transfers on zinc, thinner metal is used than for etching, as better contact is obtained over large surfaces, as well as being easier to handle.

The zinc must be well polished with very fine emery cloth and turpentine, then immersed in a weak bath of nitric acid, alum, and water, ten drops of nitric, ten grains of alum to a pint of water. This is put into a tray, the zinc immersed, and the tray rocked until the polished surface of zinc gives way to a fine matt. The plate is now removed and well washed, the seum being removed by rubbing gently with a pledget of cotton wool. The plate is now put into a whirler and coated with albumen, then whirled, coated again, whirled again, then dried over a small spirit stove. The albumen is composed of white of one egg, water eight ounces, saturated solution bichromate potash one ounce. Beat up the egg, add the water, mix, then add the bichromate solution. This mixture must be well filtered before use.

To get good prints on zinc, a whirler must be used. A film of albumen on zinc, well whirled, requires less than one-quarter the exposure of a film not whirled. Unwhirled films are uneven, one portion of plate having no film and another portion having a film too thick, through which the light, not having penetrated, washes off in development.

Inking up after exposure is effected with a glue roller, charged with thin ink, care being taken to get a very thin, even coat of ink all over the plate. From these prints upon zinc the transfers are pulled on litho-transfer paper and then retransferred to stone. The transfer to stone is best intrusted to a skilled lithographer, especially by beginners, as careless or ignorant transferring will spoil the very best photo-transfer.

Do not try photo-litho or any of the photo-mechanical processes with makeshift appliances, but get proper tools first, then the work will be easy and pleasant, and the results good.—*Br. Jour. of Photo.*

ON WOOL AND FUR, THEIR ORIGIN, STRUCTURE, CHEMICAL AND PHYSICAL PROPERTIES, AND COMPOSITION.*

By WATSON SMITH.

I.

WOOL and the different kinds of fur and hair covering certain classes of animals, such as sheep, goats, rabbits, and hares, we may generally discriminate from one another in that wool differs from fur and hair, of which we may regard it as a variety, by being usually more elastic, flexible, and curly, and by possessing certain peculiarities of surface structure conferring upon it the property of being more easily matted together than are fur and hair. Yet this attempted definition needs to be cautiously advanced, for the fact is, as Dr. Bowman, our greatest authority, observes in his work on the wool fiber: "The difference between wool and hair is rather one of degree than kind, and all wool-bearing animals have the tendency, when their cultivation is neglected, to produce hair rather than wool. Wool and hair, fur being intermediate, are simply modifications of the same root substance, and the scales of the wool fiber have a much larger free margin than is the case with hair, being only attached to the stem for about one third of their length, and in many cases the free ends are more or less turned outward, so as to present a much more serrated edge than is the case with hair. The interior portion of the fiber, however, does not differ in the least from that of hair, and can neither be distinguished from it chemically nor microscopically."

Fig. 1 shows a section of the skin with a fiber of wool rooted in it. Here we see that the groundwork, if we may so term it, is fourfold in structure. Proceeding downward, then, we have, 1st, the outer skin, scarf skin, or cuticle; 2d, a second layer of skin called *rete mucosum*, forming the epidermis; 3d, the papillary

* Read before the Chemical Club, December 4, 1888.

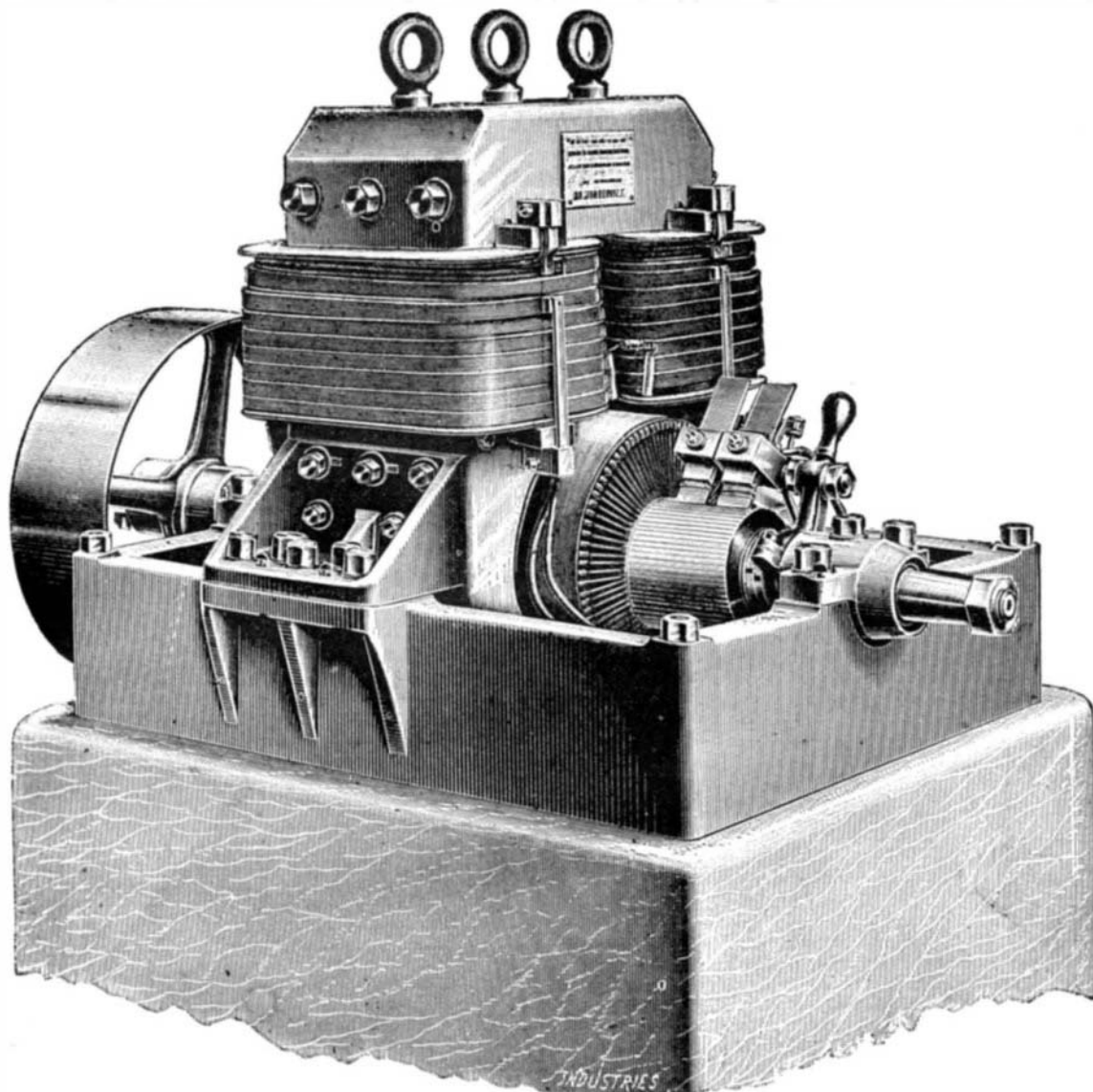


FIG. 1.—GENERAL VIEW.

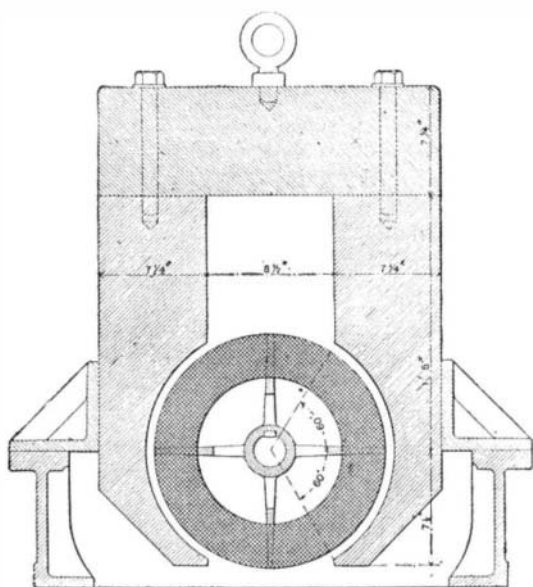


FIG. 2.

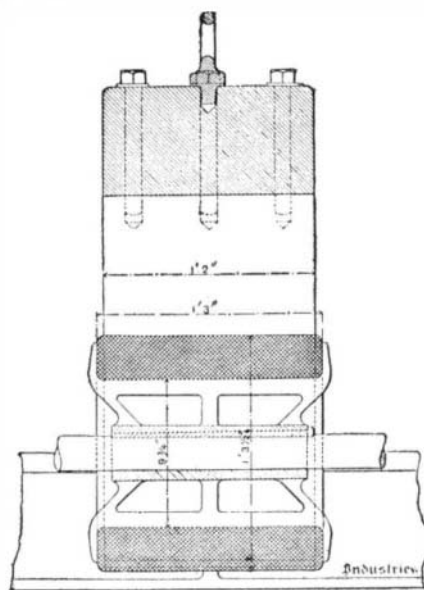


FIG. 3.

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the wire is guided by an adjustable feed motion, so that the different convolutions are placed close together with perfect regularity. During the process of winding, the intervening spaces between the arms of the spider are filled up with quadrant-shaped blocks, in order that the core may be perfectly circular. The armature conductor is wound by hand, and consists of 160 turns of 19 strand No. 16 cable, which is shaped on the outside into a rectangular or rather trapezoidal section, so as to completely fill the available space. The commutator has eighty sections, and the resistance of the armature when cold is 0.018 ohm. The magnets are of soft, annealed wrought iron, 100 sq. in. in section, and the bore of the pole pieces is $16\frac{1}{2}$ in. in the middle and $16\frac{3}{4}$ in. at the corners. The shunt winding is placed nearest the core, and consists of twenty layers 83 milles wire, each layer containing 74 turns. The total number of turns of shunt wire on both limbs is 2,960, and the resistance cold is 18.6 ohms, and after six hours' run 20.7 ohms. The exciting power of the

very well; but where fine work is wanted with absolute register, scale, and size, then the zinc method must be used.

Line transfers may be pulled from collotype plates, rivaling in sharpness and scale those pulled from zinc. But they require so much longer time preparing than the zinc plates that they are very seldom used for the purpose.

There are several ways of preparing the paper for the direct methods, each of which has its advocates. The paper may be coated with gelatine, chrome alum—a trace—and potassium bichromate, or with arrowroot and bichromate, thus making the paper sensitive with one operation. Paper so prepared is, after exposure, inked up dry and developed in hot water.

Another way is to coat the paper with plain gelatine, dry, then to sensitize by immersion in an aqueous solution of potassium bichromate, soaking the exposed print in cold water before inking up.

The ordinary transfer papers sold for carbon work,