

with a small proportion of Japan drier, as a vehicle. The details of the investigation may be found in the Journal of the Franklin Institute for July, 1904.

The reason why this difference in the size of the particles of pigment makes so marked a showing in the service of the two paints is that where the particles are coarse, relatively large oil spaces surround them; and as linseed oil is by no means waterproof, as we have mentioned, the effect of the weather is soon noticed in such paints.

Surface tension also operates in favor of the paint having the finer-particled pigment, on the same principle that causes fine sand, when wet, to hold together, where coarse sand or gravel will not.

Figure 3 shows the appearance of a paint film of the short-lived coarse-particled pigment, and Figure 4 shows that which had fine-particled pigment and was long-lived.

Fine-Particled Pigments the Best

Figure 5 shows a portion of a bridge after the paints upon it had been exposed for four years. The upright column had been coated with the bad paint, and the horizontal railing with the good. Figure 6 is another part of the same bridge in which the upright post was coated with the good paint and the horizontal railing with the bad. In both pictures and in both positions, the paint with the fine-particled pigment is seen to be in good condition, while the other is not.

These tests demonstrated that some of the most durable paints were composed of the simplest and least expensive of pigments, and created a good deal of interest because the findings ran counter to the preconceived ideas of many who had assumed that in order to be really good and give long service a paint must be composed of one of the more expensive pigments, such as white lead, and that those which contained the so-called "inert materials" were to be looked upon as "doped" products.

Because of misbranding and wholesale and indiscriminate adulteration, the manufacturers were in some cases to blame for this. For example, we have seen a supposedly oil paint that contained 30 per cent. of water. Another paint labelled "pure white lead" contained no white lead. Many other cases could be cited, and it is small wonder that such abuses led to a public outcry and legislation that was sometimes carried too far.

It became necessary, because of these conditions, to determine the truths about the properties and characteristics of the different paint materials, and the work was finally undertaken by the Scientific Section of the Paint Manufacturers' Association of the United States.

Experimental Iron and Steel Panels

A fence was built at Atlantic City, and several hundred panels were coated with paints of different formulæ in order to determine the value under exposure to the weather at the sea shore of the more important materials used as pigments, and also to show the most durable combinations of the various pigments under such conditions. Exposures were made on both iron and steel panels as well; and, subsequent test fences were erected in other parts of the country in order to get varying climatic conditions.

The tests were made under the supervision of the American Society for Testing Materials, and a vast fund of information regarding the service value of various compositions and combinations was obtained. Materials that many considered as adulterants not long ago are now known to have a definite value in the design of high-grade paints.

Misrepresentation still exists under the stress of competition, but the general plane of the paint industry is distinctly better for the simple reason that the principles of manufacture, the relation between cause and effect as applied to paints, and the properties of paint materials are all far more thoroughly understood than was the case even at the beginning of the twentieth century.

It will be clear from what has now been said that in order to be serviceable a paint must be composed of a pigment that is of a character well adapted to the conditions under which it is to be used, that this material must be in the most effective physical condition, and must be carried in a vehicle which will form an effective bond between its particles and at the same time be as nearly weatherproof as possible.

The spreading quality is a factor that should be very carefully borne in mind when purchasing paints. That having the pigment composed of the most finely divided particles, other things being equal, will spread farthest.

Specific gravity is another important factor, and should be studied accurately by the purchasing agent who is buying by the pound. The paint of the least specific gravity will be the greatest in bulk; and it is bulk, not weight, that counts in determining the spreading capacity of paints.

The labor cost of applying the paint is usually far greater than the cost of the paint itself; and it is important to remember this as a special incentive for the purchasing of the most durable paint for the purpose.

Specifications for various types of paints were the natural outcome of all the foregoing investigations and experiments with paints and paint materials. Such specifications have been drawn by the writer and others to cover paints for use under many different conditions, and these can be filled by any manufacturer who is willing to give care and attention to the work. Some of them, in fact, now carry these preparations in regular stock.

Specifications Lead to Economies

By purchasing wisely, under carefully drawn specifications, real competitive prices that represent the true market value of the paint materials plus a reasonable allowance for the costs and profits of manufacture, can be secured.

Marked economies have been effected by some of the principal railroads and by many smaller users of paints, through lowered costs and increased service as a result of working along these lines.

Large purchasers know they can not afford to do otherwise than buy according to specifications specially drawn to cover the needs of the service. It would be much to the advantage of many of the smaller purchasers who use quantities that would warrant the small expense connected therewith, if they would do likewise.

Final testing is, of course, absolutely necessary, for it is useless to buy according to specifications, or even on promises, unless the paints actually delivered are tested to determine whether they are as specified or represented.

VISIT TO OTTAWA PUMP HOUSE

Through the courtesy of J. B. McRae, consulting engineer, Ottawa; and by invitation of the mayor and board of control of that city, the members of the Ottawa Branch of the Canadian Society of Civil Engineers and their friends, including ladies, visited the new city pumping plant last Saturday afternoon. The plant was shown in operation under various loads.