JOHN HARRISON
Founder of the House of
HARRISON BROTHERS & Co.
1793

# Chemistry of Paints,

GRAYS FERRY CHEMICAL WORKS

OF

HARRISON BROTHERS & Co.,

PHILADELPHIA

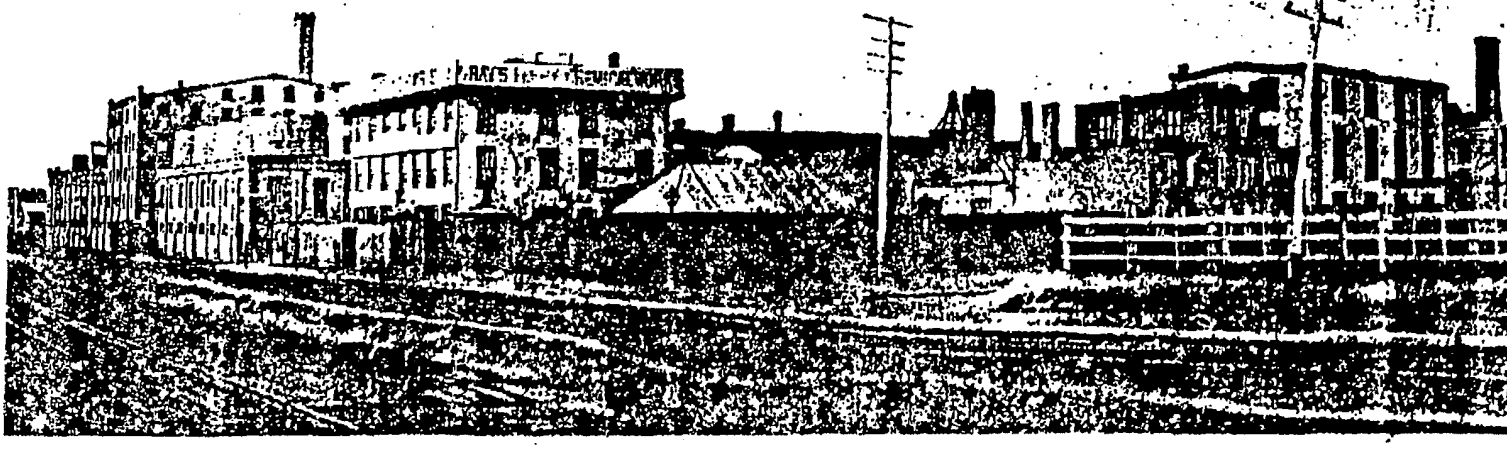
JULY 22, 1881

INDICATED THE

THE MASTER PAINTERS

OF THE

UNITED STATES AND CANADA



THE GRAYS FERRY WHITE LEAD, COLOR AND CHEMICAL WORKS,

PHILADELPHIA.

HARRISON BROTHERS & CO., PROPRIETORS.

VIEWED FROM THE SOUTH-EAST.

LMC 007050

# The Chemistry of Paints,

As Exhibited to The Master Painters' Association dur
ing a Tour through The Grays Ferry Chemical
Works of Harrison Brothers & Company,
Philadelphia, July 22, 1886.

Pigments and material used in the manufacture of paints ar
so essentially chemical products that their consideration
involved in that of manufacturing chemistry; and as manufactu
ing chemistry so largely depends on sulphuric acid, it is well t
have some information as to the manufacture of this article and i
relation, through the many intermediate processes, to the manu
facture of paints.

### Brimstone.

With that thought we start our guests at the beginning o
chemical processes, showing the pile of brimstone, which is th
crude article as received from Sicily, smelted there in a crud
way from the brimstone-bearing rock. This is crude brimstone
and it is procured by a crude process; but by selection a wonder
fully pure article can be had. That which you see in the pil
marked No. 1 is known in commerce as "Best Unmixe
Thirds," and in this instance has an actual purity of 997 in every
thousand parts; in other words, 1000 pounds of this will yield bu
3 pounds of extraneous matter.

### Sulphur Burners.

We next see it burnt in the furnaces arranged for its combus
tion, known as sulphur burners (marked No. 2). Burned in thi
way, the fumes are similar to those given from a sulphur match, and

are sulphurous-acid gas. This gas, by coming in contact with oxidizing material—generally provided in the form of nitrate of soda—is converted into the higher oxide, or sulphuric acid. The hot gases from the burners are passed through a tower called a
3 "Glover" tower (No. 3), which provides oxidizing material by means of a descending cascade of mixed sulphuric acid and nitrous products; in this tower the sulphuric acid is mingled with the oxidizing material, and thence carried into the large leaden chambers to which we will presently come.

STORAGE FLOORS FOR PAINT MATERIAL.

4 On our way to these chambers we pass through two storage floors, under them, which are used for the storage of earth
5 paints and for materials used in paint manufacture. These floors (Nos. 4 and 5) give storage to many hundred tons of material.

LEADEN CHAMBERS.

We now reach the chamber floor and have a view between two of the leaden chambers, which are known in the factory as "Chambers 3 and 4." The length of each of these is 265 feet. We walk between them to continue our investigation of the process. In these chambers there is a continual commingling of the sulphurous fumes, the nitrous gases, and steam; also more or less air, which flows in through the sulphur burners during the combustion of the brimstone. We can hardly say "air," because it is largely nitrogen, or devitalized air—that is, air with its oxygen extracted, the oxygen having gone to the sulphur in the process of combustion. The draught through the chambers carries these commingled gases along, depositing on the way, by a continual dropping, the sulphuric acid, which collects in a pan about two feet deep, provided for the purpose, at the bottom. The acid thus collected is known as "chamber" acid.

GAY-LUSSAC TOWER.

We now reach the end of the chambers and make our exit from
6 the building opposite a tower marked No. 6. This is known as a "Gay-Lussac" tower, from the name of its famous inventor, and is intended to remove any valuable constituents remaining in the



gases which have passed through the chambers, and which deposited in the liquid acid. In the process of removal of acid is employed, as in the Glover tower, the object, being to take from, instead of to give to, the gases. T flowing continually over proper material, presents a la face to the ascending gases and dissolves out the valua tions. Finally, the exit is through the high pipe marke and when the chambers are working well, the escaping g mainly made up of steam and nitrogen.

COAL CONSUMED.

We now pass through the cellar of this chambe ing, under the chambers themselves, and by a large coal-pi consumption of coal in these works is about 20,000 tons a

ALUM-CLAY GRINDING.

We arrive in the clay-grinding room (marked No. 8); is known as bauxite, and the best deposits are found in th of France. It is very rich in the material known as a This clay, after first having been thoroughly calcined, is very finely in the mills you see, which are kept continually to grind the large quantity daily used. When this clay i with sulphuric acid, the alumina is extracted, and finally as alum.

CLAY STORAGE.

We now pass out of the clay-grinding room, turn to the and on the opposite side of the street down which we a passing find other buildings connected with the manufac alum, and also a shed (marked No. 9) containing some 3000 this valuable earth.

ALUMINOUS CAKE.

We pass into the alum-cake department (marked N The aluminous cake is the crudest form of alum, and consis ply of a treatment of white clay—mostly English—with aci ed down to hardness and ground up to a powder.

ATTACKING DEPARTMENT.

From this room we enter what is known as an "attac

11 department (marked No. 11). You will here see the large vats for the treatment of the alum clay with sulphuric acid, which extracts the valuable constituent, leaving all the insoluble and useless material.

LARGE BOILER-HOUSE FOR THE ALUM DEPARTMENT.

We now again go out on the street, walk up on the west side, passing the clay stores (marked No. 9) again, and by the boiler-
12 house, at the head of the street (marked No. 12). The boilers in this house are intended solely for the use of the alum-making department. There are nine of them, with a capacity of between 600 and 700 horse-power.

ATTACK HOUSE.

We now enter another building, also known as an "attack" building, but really used for the separation of the extraneous material from the alumina solution, also for the partial purification of the same. In the cellar of this building we notice engines and mills
13 (marked No. 13) for the grinding of some of the material used in the purification processes; and on the second floor we find a
14 number of filters (marked No. 14), which are used for taking out the remaining light insoluble matter, which will not readily settle.

We leave this "attack" building by a passageway over the roof of a building containing tanks for purification processes, and
15 pass into the main alum building (marked No. 15), which on May 24 was nearly destroyed by fire, but is, as you see, now rebuilt and again in working order. We pass more filters and set-
16 tling boxes, and see the alum boiled down (marked No. 16) to a thick mass, which is fluid when hot, but becomes solid when cold, somewhat resembling a clear sugar-candy. This is perfectly pure sulphate of alumina, or concentrated alum.

PUREST ALUM.

We continue through this building, passing stacks of alum ready for shipment. Alum bears a very important part in the manufacture of colors, and it is very necessary that it be pure. The purest made is that known as "Turkey-Red" alum (sample



at No. 17), and is intended for turkey-red dyers; it
pure or free from other substances that one pound of
matter could not be found in 100,000 pounds of the a

ALUM USED IN COLORS.

Alum is interesting to the paint man as giving t
carmine and nearly all lake colors, and is used also in
lows, Prussian blues, and other paints. The produ
works is about 300 barrels daily. The alum used i
making department is the turkey-red alum.

LABORATORIES.

We pass out of this building, cross one of the railro
and go up stairs into the laboratory building (marke
where, in one of the best-appointed and largest labora
nected with any establishment, some half-dozen chemi
tinually at work examining the crude material that
the factory and testing the finished products. Besides
ists employed in the laboratory, each department is supe
chemist who has his own minor laboratory or testing
all the processes of this establishment tests must be
made to determine that the processes are being properl
ed. The "secrets" of the business of this firm are th
ment of able talent and a close attention to chemical
backed up by a liberal expenditure for experiment.

ANOTHER ACID-CHAMBER BUILDING.

From the laboratory building—on the top of which
water-tanks, and under which are stored, on the first fl
and in the cellar brimstone—we pass to another large
containing Chambers 1 and 2. It will be noticed that
buildings are of substantial stone and brick.

At No. 19 are the boilers giving the steam which mu
tinually supplied to the acid chambers; they are four
ber, of about 200 horse-power.

ACID STORES.

Walking beneath the chambers, through the coal
see oil of vitriol stored in carboys, and come to the

### CONCENTRATING APPARATUS.

The acid from the chambers is first passed into leaden pans
20 (marked No. 20), supported on iron framework enclosed in brick,
in which the first concentration is made. From these it passes
21 into the platinum stills (marked No. 21), of which there are two sets constantly at work. These stills are very costly apparatus, although externally they do not impress any one as being very valuable. They consist of a number of platinum dishes enclosed in lead; each dish has an actual money-value of some $2000. The entire plant represents about $15,000, though the space occupied by it is small.

### THE THEORY OF CONCENTRATION.

Sulphuric acid is very eager for water—so eager that if a saucerful of oil of vitriol be exposed it will draw the atmospheric moisture to it and soon run over the sides of the dish, increasing its bulk and weakening itself accordingly. Concentration simply consists of depriving the acid of its water by means of heat. Immense quantities of water are necessary to surround the apparatus to cool the acid after concentration, its temperature being from 600 to 700 degrees Fahrenheit when it leaves the platinum apparatus.

22 At No. 22 is a large tank for storing oil of vitriol in bulk; this tank will hold about 800 carboys.

23 At No. 23 is the apparatus for moving oil of vitriol. It consists of large receivers made of iron, lined with lead, into which the acid flows; when filled, the supply is cut off, and air, under heavy pressure, is forced on top, driving the acid out from the bottom by a suitable outlet. As acid is almost twice as heavy as water, it will take about twice the pressure to lift it to any height; consequently, the air-pressure required is sometimes very great, the acid frequently being lifted to a height of sixty feet. It is forced by this system to the different portions of the works. Its uses in the paint department are numerous.

Sulphuric acid has already been referred to as a sort of prime motor of chemical manufacturing processes; it might almost be compared with the engine that moves the machinery of a



factory. It would be difficult to name a paint-
thing connected with paints in which this im
cannot be found as a constituent or directly enter
nected with, its preparation. It is a large ingredi
that great bugbear of the painting fraternity, "
is a compound of barium and sulphuric acid.
in all chrome yellows which are paler than a neut
even in this it is a constituent of some of the salts
manufacture. It will be found in some form in th
earth paints. It is employed in the refining and

In these works there are four sets of sulphur bur
have seen, each burning daily from 5000 to 6000 pou
stone, or a total of 21,000 to 23,000 pounds. The fu
tinuously, day and night, weekdays and Sundays
when necessary to repair the chambers. The d
about 110,000 pounds of chamber acid, equal t
of concentrated sulphuric acid or oil of vitriol.

### OXIDES OF LEAD.

From the sulphuric acid department we go
department, passing a large stack of pig lead re
from the cars on the adjoining siding, into the furna
is found a number of retorts (marked No. 24).
placed in these, and when melted, the retorts are r
thereby constantly exposing a fresh surface of me
atmosphere and effecting a rapid oxidation. This
much a combustion as in the case of the brimstone.
ciple of the atmosphere, oxygen, combines with th
combination, or when the smallest quantity is taken,
or the yellow oxide, also known as massicot; a lit
red lead, or red oxide, also known as minium.
heated very hot, still more oxygen is taken up, and
is formed which is of no interest to painters; in fac
mary manufactory such an oxide would be known as

### GRINDING AND LEVIGATION OF OXID

We rapidly pass through this building, by the
No. 25) in which the litharge from the retorts is

water to separate the unoxidized portions, by the pans (marked
26 No. 26) on which the separated fine litharge is dried, and by the
27 mills (marked No. 27) in which the dry product is ground up ready for packing.

THE RETORT SYSTEM.

controlled by patents in the United States by Harrison Bros. & Co. for making red lead and litharge, as shown here, gives a very pure product; the lead is entirely guarded from contact with the flame, thereby preventing cinders and other dirt from the furnace becoming mixed with it, as in the ordinary apparatus, in which the flame passes over it. A large part of the product made here is used by flint-glass makers, and as they can use only the very purest of material, it follows that for all fine purposes in other lines of manufacture where these oxides are required the product of this department should be used.

OXIDES FOR VARNISH MAKERS.

The next in importance to glass makers is the varnish trade; the "Harrison" oxides are well known among the more particular varnish manufacturers, going to all parts of the country, the Western manufacturers especially regarding them as standard goods. The same litharge that is used by glass makers and varnish manufacturers is employed in this factory in color making, and is delivered direct, without any charge for packing or handling, to the color-making department, into which we shall shortly enter.

These retorts, thirteen in number, require 45 tons of lead weekly to keep them in operation.

MURIATIC AND NITRIC ACIDS.

As we are leaving this building we see to the left (marked
28 No. 28) the muriatic and nitric acid plants, which depend directly upon the sulphuric acid department. The one is made by treating common salt, or any other muriate, with sulphuric acid, which takes the place of the muriatic acid, the latter being driven off as a gas and collected in the necessary receivers; and for nitric acid the same process is used, nitrate of soda or any other nitrate being employed. Nitrate of soda, being a dangerous substance



when near burning material, is always store
vault, which may be seen at No. 29.

STORRHOUSES, STABLES AND COOPER

Beyond, on the left, are storage houses, stabl
etc., which we can see in the distance as we pass
(marked No. 30) supplying steam for pumps whi
to furnish water for ordinary uses and in case of f
tity of water daily used at these works is from 40
gallons. There are three boilers of a total capac
power, two large pumps, several small ones and
pressor in this department.

We now see the

AMMONIA WORKS

on the left (marked No. 31), where large quantiti
or hartshorn, are daily made. This a useful arti
and, as a detergent, should be more used by them

AMMONIA AND ACETIC ACID STORES

At 32 and 33 may be seen stores of ammonia
in carboys.

We now pass to the rear of the

ACETIC ACID DEPARTMENT.

The acetic acid employed in the arts is m
by the dry distillation of wood. It is a prod
manufacture of charcoal, known in its crude form
neous" acid; so that it may be concentrated and
the charcoal works, which are principally in the
timber for burning is abundant. It is mixed with li
known as acetate of lime—a very aromatic substan
nary impure state. (A sample of acetate of lime at
means of sulphuric and muriatic acids the acetic aci
from the acetate of lime, and by distillation collect
essary receivers. By undergoing various purificatio
is sufficiently purified from the empyreumatic matte
cause of its source of production, necessarily accom
used, when properly diluted with water, for housel

The acetic acid made in this way is precisely the same as that made from alcohol in the fermentation of cider and other alcoholic material. The quantity of acetic acid made daily in these works is 16,000 pounds, which would be equal to the acid in 450 barrels of table vinegar. Acetic acid plays a very important part in color-making, forming, when mixed with litharge, acetate of lead, or the well-known sugar of lead—probably more used in color making than any other salt.

A chart is shown which gives a very clear idea of how the Grays Ferry Chemical Works produce the finest painters' colors from the crudest material.

We leave the acetic-acid building, passing by the special laboratory for this department (marked No. 35), stroll up the street leading to the wharf on the Schylkill River—at which the largest class of sea-going vessels can discharge—and now direct our steps to the departments which will more closely interest our friends.

35

As we turn into one of the cross streets we pass at the corner the

36

OIL-TREATING HOUSE,

in which are seen a number of large kettles in which the oil is being treated to remove all impurities and give it much greater durability. It may be unnecessary to state that it requires a pigment and a vehicle such as oil or varnish to make a paint. Both are essential, but on the oil the more depends; and it is the great object in the paint works of this establishment not only to bring the oil itself to the most desirable condition, but to combine it in the best manner with the pigments used. The handling of this oil is particularly worthy of notice. It is transmitted by means of air-pressure directly to the boilers from the cellar of a building where it is stored in large iron tanks; this edifice is about 250 feet distant. After treatment it is siphoned into a large receiver, whence again it is delivered by this air-pressure into the settling tanks in the different stories of the paint buildings, from whence it is drawn for use.

We are now entering the

PRINCIPAL COLOR-MAKING BUILDING,

and we pass the different floors where the principal operations



of color making are carried on. On the first floor on the
get a hasty glimpse of a

DRYING ROOM

(marked No. 37) recently constructed experimentally o
ly-applied principles, whereby the operation of drying is
expedited.

The next floor above is simply devoted to storage
holding large vats which open onto the third floor. At th
of the stairs on the third floor is the color maker's labo
(marked No. 38). The color maker is a chemist trained
general laboratory of the works, and he has for his ass
practical color makers who have had experience in Europ
America; so that this department is well equipped wit
necessary talent. While

COLOR MAKING

involves what might be called many "rule-of-thumb"
tions, yet every one of these so-called "rule-of-thumb"
tices, when viewed from a scientific standpoint, is capa
being resolved and amplified into *scientific* practices. A
deal of mystery is thrown around this business, but, aft
success depends upon education guided by practical exper
Many of the most valuable chemical theories have been ev
from facts or results noticed and known for a long tim
workmen, and it is only when some one of them inquires in
cause of certain effects that the reason or theory is finall
covered and more fully and scientifically applied. Whe
the color-making department, it is ascertained that brown
of lead—an impure salt as compared with the beautiful
crystallized sugar of lead—will make certain colors whic
white will not produce, we soon learn that the very im
ties, which consist of pyroligneous matters, have a pec
mordanting effect which prevents the reaction of the re
salts on the newly-formed color, a reaction that would take p
if absolutely pure chemicals were used, without the pyrolign
mordant or its equivalent.

The operations carried on on this floor are those for the manufacture of the different

WOOD LAKES,

Florentine, chatamuc, etc.—also rose pink and Tuscan, red, which are properly classed with the lake colors. The latter is a sort of connecting-link between the lake colors and the pure mineral colors, being a combination, when properly made, of a good wood lake with Indian red.

After a hasty glance here we pass up to the

FOURTH FLOOR,

where we see the drying rooms, mills for grinding vermilions and the bins for storage for same.

On the

FIFTH FLOOR.

we again pass storage bins, packing tables and drying rooms. Here the drying rooms are thrown open for inspection. They are arranged with non-conducting material at the floor and ceiling to prevent any fire spreading that may occur from spontaneous combustion due to the presence of the hot steam-pipes and drying frames. The successful drying room must be provided with a continual supply of dry air, which becomes saturated with the moisture of the material to be dried, and is then exhausted by means of the usual exhaust appliances.

We now pass from this building over a bridge, crossing its lower central part and having quite a good view of the adjacent city; also a sight of the

BALTIMORE AND OHIO RAILROAD

inlet to Philadelphia, which is rapidly approaching completion. Beyond the Baltimore and Ohio Railroad cut are the Kalion Chemical Works, which have been constructed at the instance of the owners of the Grays Ferry Chemical Works and Mr. Henry Bower for the manufacture of bichromate of potash, one of the most important of color-making salts. All of the bichromate of potash used at the Grays Ferry Chemical Works comes from the factory which we see before us, and is the purest made. By many



who are unprejudiced it is preferred to the Scotch make, has always been considered very pure.

We now enter the fifth floor of the south end of the color-making building, pass the

BLUE AND GREEN GRINDING MILLS

(marked No. 39 and No. 40), then down through the fourth which is devoted to the storage of blues and greens, then third floor, where we see the operation of

BLUE MAKING,

which essentially consists of precipitation of a prussiate of from prussiate of potash and an iron salt, generally copp The subsequent operations consist of oxidizing the precip to different degrees of oxidation, so as to produce light or blues—those that will make sky-blue tints or purple tints, with bronze, etc.

We now turn into the central portion of the building, w may be noted the operations of the

MAKING OF GREEN

(marked No. 41) and yellows (marked No. 42). The colors made from the chemicals, which are prepared in the smaller having the necessary steam and supply pipes; through the l the material may be forced into the tubs by the ever-present tem of compressed air. The solutions of chemicals dilute proper density are run jointly into the large tubs into which color is "struck," to use the color-maker's vernacular. operation is known as "striking the color."

BARYTES.

It is at this point that for low grade colors the adulterants successfully used; the main adulterant is that article which robbed many a painter of money—barytes. It is perhaps not to be too severe on barytes; sometimes it serves the purp of diluting a color, or, more properly speaking, separating particles and possibly preventing reactions which might t place more speedily if the color were perfectly pure. Barytes its precipitated form, or as blanc fixe, is an invaluable mate

when used as a base for certain light lake colors, which could hardly be collected but for such a base; so, when an analysis of a color shows the presence of barytes it is necessary to go farther—and the intelligent analyst knows how to go farther—to discover whether this sulphate of baryta which he finds is the crude, native mineral simply ground to a fine powder or that precipitated to impalpable fineness from solutions—the blanc fixe. The proprietors of these works stand alone in having steadily and persistently for a long time past exposed to painters the frauds practised on them; yet they know that sulphate of baryta is like a great many other things in constant use—it may be used properly or it may be abused. On general principles, however, it is safe to resolutely turn from any color which consists largely of barytes. Some colors are wonderfully strong, and may still be apparently good colors, when there is no standard for comparison by, and yet contain 95 per cent. or more of this adulterant.

### FILTERS.

We now go down another flight of steps, pass filters of all kinds, shapes and sizes from the ordinary box frame and muslin style to the elaborate filter press, in which the operation of filtering and pressing are carried on at once—we get a distant view of the slowly filtering blues. Pure blue is so extremely fine and so nearly in a state of solution that it cannot readily be filter-pressed, the immense pressure driving it through almost any fabric that will allow the passage of water.

### ENGLISH AND ARTIFICIAL VERMILION.

In another direction are seen machines for the manufacture of English vermilion, and the red coloration shows the place of manufacture of artificial vermilion, this latter, when well made, being, for temporary painting, a beautiful substitute for the English.

### AMERICAN VERMILION.

We now enter into another red department—where everything is painted red, as it were; this is the American vermilion or imperial scarlet department. The artificial vermilion has largely taken the



place of this also, although the capacity of this plant—which is fr
2000 to 3000 pounds per day—is well occupied. We see one of t

### WATER FILTERS.

large filters employed for filtering the water used in these wor
The clearest of water may contain elements destructive not only
human health, but to color making; this filter removes the visib
impurities, and also those impurities—mainly organic matters
which in a state of solution give a sparkle to the water an
lead one to suppose that it is the best that could be obtained
All water used in color making, when the colors are such a
will meet the demands of the present day, must be purer tha
can be supplied from any settling pond or crystal lake.

It is impossible to give our guests a complete view of thi
department, both for want of time and from the impossibility of con
ducting a large company through the many passages leading int
the different departments. This can be done with only a few a
a time when ingress and egress can comfortably be made through
one narrow passageway. It is impossible to show the drying
rooms for the different reds, and the elaborate sieving apparatus,
and the details of other operations of color making.

### DRY PAINT GRINDING.

We now go across the courtyard of the color making depart-
ment and enter an annex to the mill house, in which, operated by
an independent engine, are a number of mills for grinding dry
colors. Here you will see either in process of grinding, stand-
ing around ground, or ready to be ground, blacks umbers,
siennas, ochres and other earth paints. Every dry paint, no
matter how fine it may be, must first be passed through these
mills, which will effect a grinding that cannot be done in the oil
mill. These mills are all of the best construction, and it will
be noticed that they are almost noiseless in running. In this
department umbers and siennas—which in the original state vary
much in shade—are sorted and mixed in such proportions as will
ensure the shades adopted as standard in these works.

We pass out of this room by a door opposite the boiler-house
which supplies steam for the paint-mill house. There are five
boilers in this house, aggregating 350 horse-power.

MACHINE SHOP.

Passing between the boiler-house and the principal mill house, we enter the latter at the east end to have a view of the machine shop of the works, in which are constructed the paint-mills used in the establishment, and where repairs to machinery
43 are made.

AIR COMPRESSORS.

We see several large air compressors (marked No. 43) at
44 work, have a view of the principal engine (marked No. 44) for the paint department, and then enter the white paint department.

ROTARY LEAD COOLERS.

A feature of the white paint grinding of this establishment is that as it comes from the mill all the ground material is imme-
45 diately cooled by rotary coolers (marked No. 45) fed with a continuous supply of cold water.

STANDS FOR AGEING LEAD.

From these it is conducted into large stand casks (marked
46 No. 46) holding from 4000 to 8000 pounds each, where it is allowed to season and to age. It is claimed that this gives the lead better working properties, and in substantiation of this claim many painters—especially in New York city—will use the Harrison lead and accord it the same place in their estimation as they did the English lead, which at one time was so extensively used in the seaboard cities. When lead is packed freshly ground from the mill, it is apt to be lumpy in the keg, and it will acquire bad color when the mills run very hot. Many painters have noticed that lead has been delivered to them fresh from the factory so hot that the packages could be handled only with discomfort. It is claimed for this department that more attention is given to the needs of the different classes of lead consumers than in that of any other lead works. The stiff, cheesy lead, such as already mentioned, and preferred by painters who have been accustomed to English lead, and who



do not mind the labor of breaking it up; a stiff ground not so stiff as the above, intended especially for inside f a lead that can be used with perfect confidence of go free from spots; a thinner ground lead, intended for outs and rather oily, known as "outside" lead; lead ground ly for oil-cloth makers; lead especially for shade-cloth and for other trades—are, among some of the specialtie department. Some of the best fresco work of this city done exclusively with the "Harrison" lead. Only the of grinding lead can be shown here as the corroding is

KENSINGTON CORRODING WORKS,

the old works in the Kensington district of this city; t Ferry Works being comparatively new having all been since 1860, after the place at Kensington had become un the demands of the business of the firm. As the Ke works are almost exclusively devoted to the manufa white lead, and have very great facilities for grinding ar ingfacilities—which are often deficient in other lead wo product is one of unusual whiteness and fineness; s snowy whiteness the "Harrison" lead cannot be excelle visiting members of the association desiring to see the of white lead manufacture, will be furnished with through the Kensington works.

We now go to the upper story, noting on our way th (marked No. 47) of cans and other empty packages on th ing shelves.

DRYING PANS.

On the second we pass rapidly by the pans (marked for heating the material prior to grinding, this heating i entire freedom from moisture. We see the mixers ( No. 49) for mixing the white paint with the oil prepara grinding, and then take our route through the

COLOR PACKING DEPARTMENT,

where the paints in small cans are labelled and put up for shipment. Each can before shipping is passed t

a steam testing machine, to determine any leak, that to this point, may have escaped notice.

We now file past a long line of twenty inch

COLOR MILLS

50 (marked No. 50) devoted to the grinding of the coarser kinds of painters' colors, and then have a view of the mill room (marked

51 No. 51) which is occupied to every inch of available space with small (ten inch) stone mills in which fine painters' colors are ground. The business of this firm in painters' colors has grown to be almost exclusively one line—their strictly pure goods. It is confidently believed by them that no other house is offering to the painters at ordinary prices a full line of absolutely pure colors.

We ascend to the third floor and have a view of the

NEW MILL ROOM

52 (marked No. 52) for the grinding of painters' colors, in which will be placed as rapidly as they can be finished about 200 of these small mills.

There is not an iron mill in use in the entire establishment; all the grinding is done between the best burr stones. In this way the purity of the tone of the color is maintained. Iron mills will spoil a color, even as dark as burnt umber, when it is attempted to grind to extreme fineness.

The construction of this room for grinding fine colors gives the very best of light and entire freedom from dust. Harrisons' painters' colors, such as umbers, siennas, Prussian blues, etc., are so finely ground, that the falling dust will frequently injure them enough to require their re-grinding.

We now cross the bridge to the upper floor of the

READY MIXED PAINT DEPARTMENT,

which is supplied with white lead and zinc from the white paint department, and with colors from the color-grinding department. The oil is delivered by air-pressure from the oil-treating house to the upper floor of this building, and mixed with the white lead and zinc white in the



LARGE MECHANICAL MIXERS

(marked No. 53), that can be seen extending their l
through the several stories. Each of these mixers
mix 700 gallons at one time. There are twelve of
which may be charged daily if that is necessary; but it is
sidered preferable to mix for at least 48 hours. By this a
oughness of mixing is obtained which it would be impossib
give by hand-power. These mixers are only used for mi
the white lead and zinc base of the paint; the coloring is do
n smaller mixer (marked No. 54), the white base being d
off into a truck tank holding 150 gallons, this much being co
at one time. Very light tints are stored directly in the

STORE TANKS

(marked No. 55), which you see stretched out in long li
each one of these store tanks holds from 150 to 200 gallons;
these tanks the paint is drawn into packages for sale.

We, probably, should not linger long in this department
many painters are not friendly to paints mixed ready for
though it may be claimed, we think, with great justice, that
efforts of ready-mixed paint manufacturers to introduce t
goods to the public notice have made a popular demand
painting, which no effort of the painter himself would ever h
succeeded in creating. If ready-mixed paints have tempora
turned some poor mechanics into painters, the change of oc
pation has not lasted long, we think, because the man who
painting to do soon finds that to have it done efficiently
efficient mechanic must be employed. The man who is enab
to do his own painting by means of these paints otherw
would not have painted at all, and once his buildings
covered with color, the improvement is so great that
thinks he must continue to keep them in good appearan
lending eventually to the employment of the experienced paint
We believe that if the influence of ready-mixed paints upon t
business of practical painters be carefully examined it w
be found largely to their advantage in many indirect, if n
direct, ways, or that the advantages accruing from the intr
duction of these goods have been greater by far than the disa

vantages. The same arguments that are used to-day against ready-mixed could with equal justice have been urged against colors ground in oil, which deprived many shops of the labor over slab and muller—a labor some of our older visitors may yet remember. We think it can hardly be recalled as a pleasurable labor.

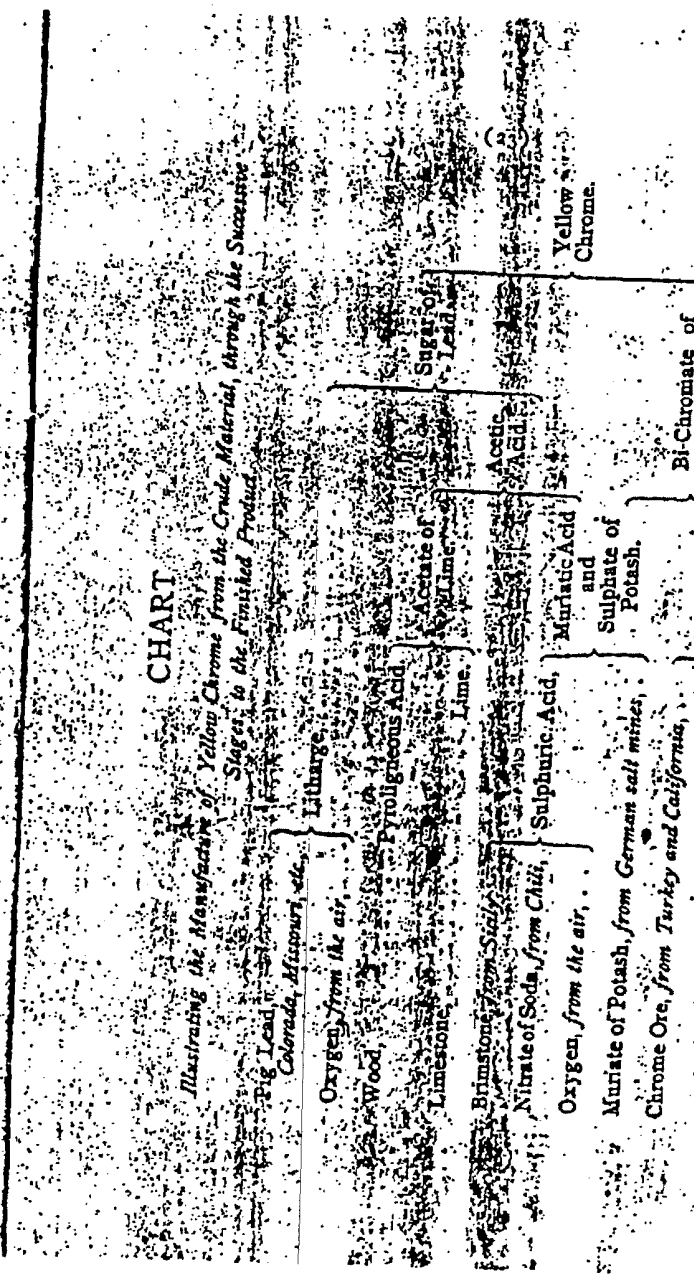
Some facts in connection with the paint business are well worthy of consideration. There is, probably, more capital invested in the manufacture of ready-mixed paints than in any other branch of the paint business, yet every division of the paint business has increased proportionately with the general increase of manufactures in this country. They have evidently found a place for themselves which cannot be ignored; if the place were not vacant, then it was made, and it has been made, we think, permanently. Many thousands of gallons of trash have been made, partly through ignorance of the proper methods of mixing the paint so as to cause it to keep well for a long time, and perhaps more through the cupidity of the manufacturers who could use lime water, silicate of soda and other compounds which will carry water in indefinite quantities into an oil paint; but, on the other hand, there are a number of manufacturers who are honestly striving to give an article that will meet the requirements of the most critical. And that is certainly the aim of this house.

We pass through the cellar of this building, which gives unusually fine, dry storage and a good light place for packing.

We go to the second floor of the west end of the building, through painters' sundries storage, across the bridge to the

ADVERTISING DEPARTMENT,

where the sample cards are prepared; thence through the printing office where all the labels used by the works are printed, and where the numerous publications periodically issued are prepared; thence through the circular room where the sample cards are finished, down through the office of the establishment, and thence to the banqueting tent where it is hoped there wil be a great "feast of reason and flow of soul," as well as what is more gratifying to the grouser element of human nature.



# CHART

*Illustrating the Manufacture of American Vermilion from the Crude Material, through the Different Stages, to the Finished Product.*