

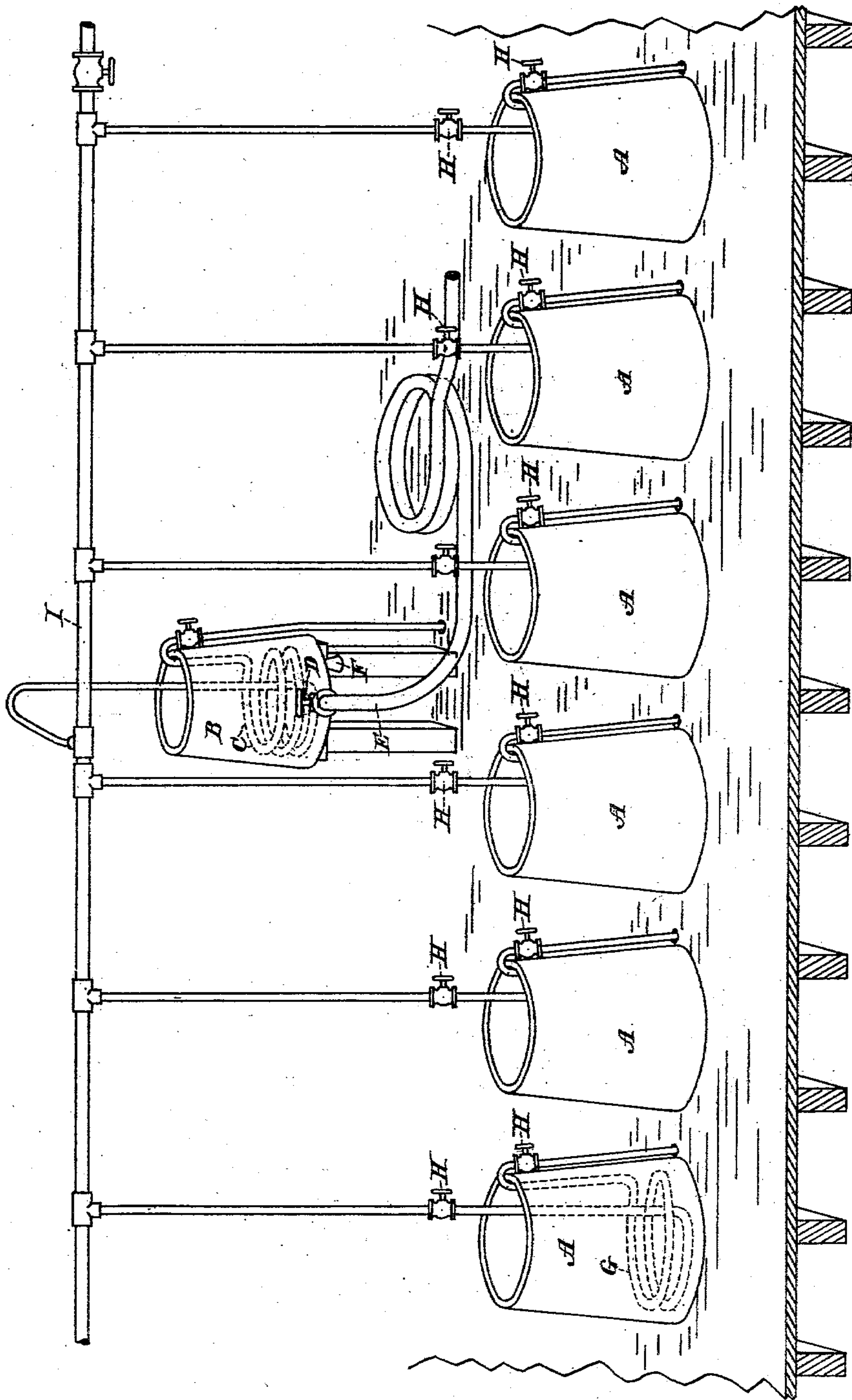
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A. W. PLAYNE.
PROCESS OF PREPARING INDIGO VATS.

(Application filed Feb. 18, 1902.)

(No Model.)



WITNESSES:

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PROCESS OF PREPARING INDIGO-VATS.

SPECIFICATION forming part of Letters Patent No. 715,213, dated December 2, 1902.

Application filed February 18, 1902. Serial No. 94,611. (No specimens.)

To all whom it may concern:

Be it known that I, ALEXANDER WHATELY PLAYNE, woolen-cloth manufacturer, a subject of the King of Great Britain, residing at Dunkirk Mills, Stroud, in the county of Gloucester, England, have invented a new and useful Process of Preparing Indigo-Vats, of which the following is a specification.

This invention relates to improvements in the preparation of indigo-vats for dyeing, whereby the dyeing operation may be so thoroughly and efficiently performed as to admit of an indigo-vat being run off without serious loss immediately after dyeing a full charge or else of being "wared up" or replenished with additional indigo and continued at work.

I will describe the process as applied to dye admiralty shade on white navy-serges by means of natural indigo; but it is to be understood that either natural or synthetic indigotin or synthetic indigo may be employed in about the same proportions as and in lieu of natural indigo.

The accompanying drawing is a perspective view, with parts in section, of a plant suitable for the purpose of my present invention.

For a series of dye-vats A of the ordinary size—say fourteen hundred gallons—a mixing-vat B to contain two hundred and fifty gallons of water, but of a size to allow frothing up to double this capacity, is placed at a higher level than the dye-vats and is provided with a steam-coil C and with a large draw-off cock D and hose E, the cock being placed at such height as to insure only the clear liquor being drawn off.

F is a bottom plug provided to facilitate the draining and cleaning of the mixing-vat.

The indigo-dye vats are also provided with steam-coils G, controlled by stop-cocks H, it being understood that no naked steam is to be admitted to any of the vats.

I is the pipe from which steam is supplied to the coils C and G.

Each dye-vat is set as follows: In the mixing-vat containing two hundred and fifty gallons of water from ten to eighteen pounds of dry carbonate of potash is first dissolved and

well stirred, the preferred proportion being fourteen pounds carbonate of potash for eight pounds fine commercial indigo or sixteen pounds carbonate for ten pounds indigo, or equivalent quantities of other alkali may be used, care being taken, however, to avoid caustic alkalies for woolen goods. Fine zinc-dust is stirred into a solution of bisulfite of soda (at about 54° Twaddell) in quantities and proportions hereinafter mentioned. For eight pounds indigo the preferred quantities are thirty pounds zinc to one hundred and eighty pounds bisulfite, and for ten pounds indigo the preferred quantities are thirty-four pounds zinc to two hundred and four pounds bisulfite, the preferred relative proportion being one zinc to six bisulfite, but being susceptible of variation between one to four and one to eight by diminishing or increasing the quantity of bisulfite. The quantity of zinc may, however, be varied considerably, as any amount from, say, twenty-five pounds to forty-eight pounds will answer for eight pounds of indigo in fourteen hundred gallons of water, the preferred quantity of bisulfite relatively to the weight of zinc used being in all cases determined in accordance with the above-mentioned proportions. The two are mixed for from two to five minutes, and then the mixture is added to the nearly-boiling liquor in the mixing-vat. The mixing-vat is now brought to the full boil (212° Fahrenheit,) whereupon it will froth up and should be well stirred. As soon as the frothing begins to subside the steam should be shut off from the coil and the vat allowed to settle clear, which it should do immediately. Meantime the dye-vat which it is desired to "set" is half-filled with the softest available water, brought to the boil, and the steam shut off. Then the clear liquor from the mixing-vat is run into the dye-vat through the hose well below the surface of the liquor in the dye-vat, after which the mixing-vat can be cleaned out through a large bottom outlet. Then from forty pounds to fifty pounds of indigo paste, preferably prepared by grinding indigo with glycerin and contain-

ing from eight pounds to ten pounds of fine commercial indigo, is stirred into a dye-house tub full of liquor taken from the dye-vat and is then carefully run back into the vat through
 5 a very fine sieve. The dye-vat is then brought again to the boil (212° Fahrenheit) and should be well stirred, and as soon as the froth begins to subside steam should be shut off and the vat should be filled up with cold water
 10 introduced through a hose under the surface of the vat liquor and when full should be well stirred. It will now be at about 150° Fahrenheit, perfectly clear, and ready for use.

The dyeing operation is performed by immersing two hundred pounds of navy serge (which has first been well wetted out) beneath the surface of the liquor. Owing to the mode of preparation of the vat, there is no sediment, so that the trammel-net can be lowered to
 20 within a few inches of the steam-coil. Consequently the working space in the vat being thus greatly increased the quantity of cloth that can be dyed is more than double that which can usually be dyed in a vat of the same size, so that the vat can be at once almost completely exhausted of indigo.

The cloth is to be hawked in the usual way, either by hand or machine rollers, until the color is well hearted and is then to be wrung
 30 out, well aired, and, if required, again run through the vat for a few turns to darken the shade.

After the dyed cloth is fully aired it should be run through hot or boiling water made sour
 35 to taste with hydrochloric acid in order to bring out the full beauty of the color.

The dye-vat may now be run off without serious loss and started afresh, or the dye-vat instead of being run off may be replenished by
 40 mixing a fresh charge of indigo with two hundred and fifty gallons liquor taken from the dye-vat, then deoxidizing and boiling the same in the mixing-vat and running it thence into the dye-vat, which should be kept at about
 45 140° Fahrenheit. As, however, in the operation of "waring up" or replenishing the vat for continuous working much has necessarily to be left to the dyer's judgment, the vat is liable to get out of order, owing to an error
 50 of judgment or from other cause. It is therefore of great advantage to be able to run the vat off without serious loss and to start afresh, either for each batch of goods or whenever the vat may happen to get out of order.

It is to be observed that the quantity of zinc used varies, partly in proportion to the water in the vat and partly in proportion to the quantity of indigo, the following rule being given as a practical guide for the proportion of zinc-dust, viz: ten pounds zinc-dust
 60 for every one thousand gallons of liquor the vat contains when full, and a further two pounds of zinc-dust for every one pound of fine indigo or every five pounds of indigo
 65 paste. For example, fourteen hundred gallons and four pounds indigo require four-

teen pounds plus eight pounds equals twenty-two pounds zinc, fourteen hundred gallons liquor and eight pounds indigo require fourteen pounds plus sixteen pounds equals thirty
 70 pounds zinc, fourteen hundred gallons liquor and forty pounds indigo require fourteen pounds plus eighty pounds equals ninety-four pounds zinc. It is also to be observed that the relative proportion of the carbonate of
 75 potash is the greater the greater the quantity of indigo used, and, conversely, the proportions varying from one and one-fourth to two and one-half carbonate of potash for one indigo or five indigo paste.

The following is a table of approximate proportions for different shades, the amounts given in the first two columns being alternatives the one for the other, the greater the quantity of indigo the deeper the shade.
 85 There is, however, a wide margin of practical efficiency either way from the specified quantities.

Indigo.	Indigo paste.	Water.	Dry carbonate of potash.	Zinc-dust.	Liquid bisulfite of soda 53°-54° Tw.	Cloth to be dyed at one dip.
Lbs.	Lbs.	Gallons.	Lbs.	Lbs.	Lbs.	Lbs.
0.4	2	1,400	0.5	14.8	88.8	200
4	20	"	5	22	132	"
8	40	"	14	30	180	"
10	50	"	16	34	204	"
16	80	"	32	46	276	"
20	100	"	36	54	324	"

In refreshing a fourteen-hundred-gallon dye-vat by adding thereto eight pounds indigo the two hundred and fifty gallons liquor taken from the dye-vat and put into the mixing-vat would require at the above-mentioned
 105 rate two and one-half pounds plus sixteen pounds equals eighteen and one-half pounds zinc-dust.

It is to be understood that instead of using zinc alkali and bisulfite of soda taken separately, as above described, double salts or compounds produced therefrom might be employed—such, for instance, as zinc sodium hydrosulfite—and that in lieu of zinc an equivalent quantity of another reagent may
 110 be used with the same relative proportions of carbonate of potash, an essential feature of the process being the perfectly-balanced proportion of alkali both to the indigo and to the zinc or equivalent reagent, whatever it may be.

Only piece-dyeing has been described; but it will be understood that the process is of course applicable to wool yarn and sliver dyeing with the ordinary differences in handling the different goods.
 125

For dyeing cotton goods more indigo should be used, and there is not the same objection to using caustic alkalies with cotton that there is with woollens.

I desire it to be clearly understood that in
 130 the appended claim equivalents of the substances named are covered. Thus where I

have named "indigo" this is natural or artificial indigo as well as natural or synthetic indigotin.

I claim—

- 5 The improvement in the method of preparing an indigo-vat for dyeing, which consists in mixing zinc with bisulfite of soda, then boiling the mixture with a solution of alkali, then decanting off the clear liquor into the

dye-vat below the surface of hot water therein, then adding indigo to liquor taken from said vat, straining the mixture, returning it to the vat, and boiling the vat liquor, as specified.

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Witnesses:

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