FLOUR MILLING.—THE ELECTRIC MIDDLINGS PURIFIER.

[*Continued from first page.*]

yielded a flour as white as that from winter wheat and much stronger, owing to its larger percentage of gluten. The new method was characterized as high grinding, the stones being set so far apart at first as to granulate rather than crush the kernel. The stages of this process were four: (1) the granulation of the berry; (2) the separation of the product ("chop" or meal) by bolting into fine flour from the starchy center of the grain, the middlings or hard glutinous portions, and the coarser bran; (3) the purification of the middlings by an air blast, which winnowed away the bran mixed with them; (4) the regrinding and rebolting of the middlings, thus getting a strong, white, "fancy," or "patent" flour.

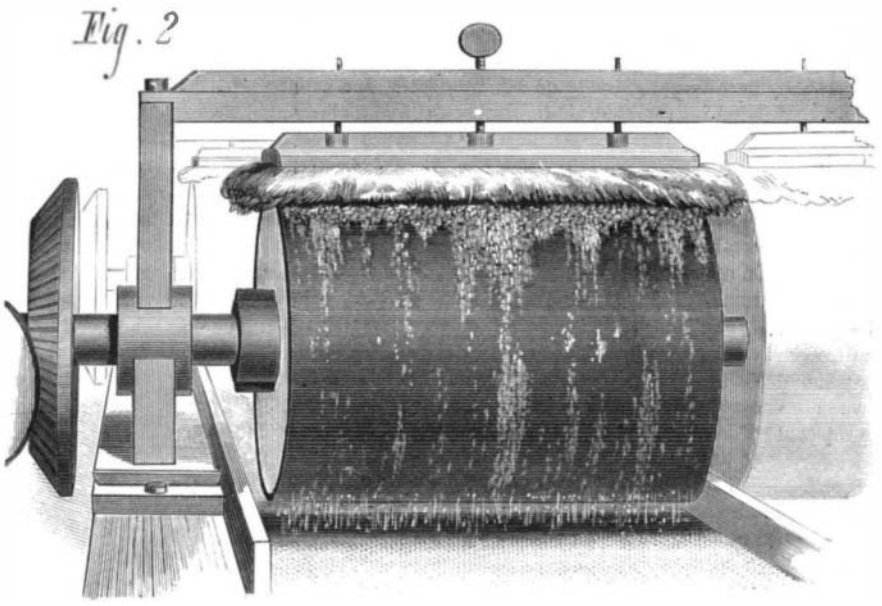
Under the stress of competition and the necessity of obtaining larger and larger yields of high quality flour, through the increase of middlings and the more perfect separation of discoloring elements, the still more complicated processes of gradual reduction were developed. By this method the aim is to remove the hull as completely as possible with the least breaking, to separate the weak flour of the heart of the grain from the rest, and to convert the more glutinous parts of the berry into high grades of flour by slow and gradual reductions, each time subjecting the several grades of middlings to successive purifications and subsequent reductions by means of high grinding, or by crushing between rollers. It thus came to pass that the work of purifying middlings became the most important part of the milling operation, and the purifiers and their appurtenances the most conspicuous and characteristic portion of the machinery of the flour mill.

The higher quality of the flour produced justified the greater cost and trouble, but the system was not all gain. The fine flour-dust blown about the mill, particularly through the systems of purifiers and into the settling rooms or dust houses, was soon found to be as explosive as gunpowder; and several mills were wrecked by the careless handling of lights or by chance sparks from the rolls or stones firing the dust in the atmosphere of the mill or in the purifiers. The inapplicability of the purifying system to the smaller custom mills, which constitute numerically the larger part of the milling interest, was another though minor objection, the chief objections being the extra life and fire risk involved; the cost and cumbersomeness of the purifying systems; the power required to operate them; the space required for dust houses; the wastefulness of the system, some of the finer flour being blown away with the bran; and the largely increased complication of the work of flour making.

Impressed by the prevailing discontent of millers, both at home and abroad, with respect to the means of purifying middlings in general use, a young American miller, Mr. Kingsland Smith, naturally gave much thought to the problems involved. While making a practical study of the European systems of milling in 1876 and 1877, Mr. Smith conceived the idea of using frictional electricity to remove the bran, and experimented enough with an electrically excited hard rubber roller to convince himself that the matter was worthy of investigation. On his return home, he referred the problem to his friend and former classmate, Mr. Thomas B. Osborne, of New Haven, whose inventive talent he had a high respect for. Young Osborne, then a student at Yale College, undertook the task, and in a short time devised the plan of the desired machine. It consisted of a series of hard rubber rolls (electrified by the friction of hair, silk, wool, or other suitable material), under which rolls the middlings were to pass slowly along a shallow receiver, the latter being rapidly shaken so as to bring the bran to the top. The expectation was that the particles of light bran would be attracted to the revolving rolls, where they would cling until carried over a bran receiver into which they could be brushed.

His principal doubts were whether the electrified rolls would not also attract the floury particles, and whether the material attracted might not be repelled so quickly as to defeat the desired object. Both these doubts were dissipated by the action of the first working model of the machine. The principle of his device being happily established, Mr. Osborne added the necessary attachments, and had made a working machine with twelve rolls. This machine was tested in New Haven about a year ago, and from its successful working attracted much attention. It remained to be proved, however, whether the machine would be equally efficient in practical use in all sorts of weather. To settle this question a machine was placed in the Atlantic Mills, Brooklyn, N. Y., where, since May, 1880, it has been run almost continuously as a part of the mill machinery. The construction and appearance of the electric purifier will be made clear by the engraving on our front page. The material to be purified—middlings, bran, and flour dust in whatever combination—is received at the further end, and passes slowly under the rolls about two inches below. The agitation of the sieves causes the bran to rise to the surface, whence the light particles leap to the rolls and cling thereto until brushed into a shallow gutter placed in front of each roll. Meantime the heavy and electrically rejected middlings descend by gravity and pass through the bolts in the order of their fineness. Traveling brushes constantly sweep

Fig. 2



Action of Electrified Roll on Bran.

ELECTRIC MIDDLINGS PURIFIER.

the bran from the gutters into the bran receiver on the left side of the purifier, in which is seen the spiral conveyor. By the time the last line of rolls is reached the material has been successively diminished by the abstraction of the bran and the screening out of the several grades of middlings, until only a trifling quantity of heavy refuse (if there be any) is left to pass over the tail of the purifier into the spout provided for it.

The power required to operate the purifier and generate the electricity employed is so slight that a man can work the entire machine with one hand. The trial machine in the Atlantic Mills purifies over fifty barrels of middlings a day, and its efficiency appears to be entirely unaffected by lapse of time or atmospheric changes. The machine occupies a space nine feet long, five and a half feet high, and three feet wide. The proprietors of the mill say that it works equally well on spring and winter wheat, and on all grades of middlings, and absolutely without dust. Dust-house material, when passed through the electric purifier, yields fully half its weight of fine flour and middlings suitable for flour.

This alone would effect great economy in the working of large mills employing air purifiers. Compared with the best air purifiers in use, by weighing materials and products, the difference in favor of electric purifying is found to be from six to eight per cent. The saving of space and power is even more remarkable, the extra room required for air purifying and the power needed to drive the machinery and supply the blast being equivalent to one-tenth the capacity of a mill; in other words, without any addition to the power employed, the output of a mill may be increased ten per cent by the introduction of electric purifiers. For example, the Atlantic Mills have a maximum capacity of 700 barrels a day, and average 600 barrels. The space saved by displacing the air purifiers is 2,500 square feet. At the same time the engine is relieved of work requiring 22 horse power, now employed in driving the fans and other purifying apparatus. The power saved by electric purifying will easily grind 60 barrels a day, and the space saved will amply accommodate the stones and other machinery required to increase the average output to 660 barrels a day.

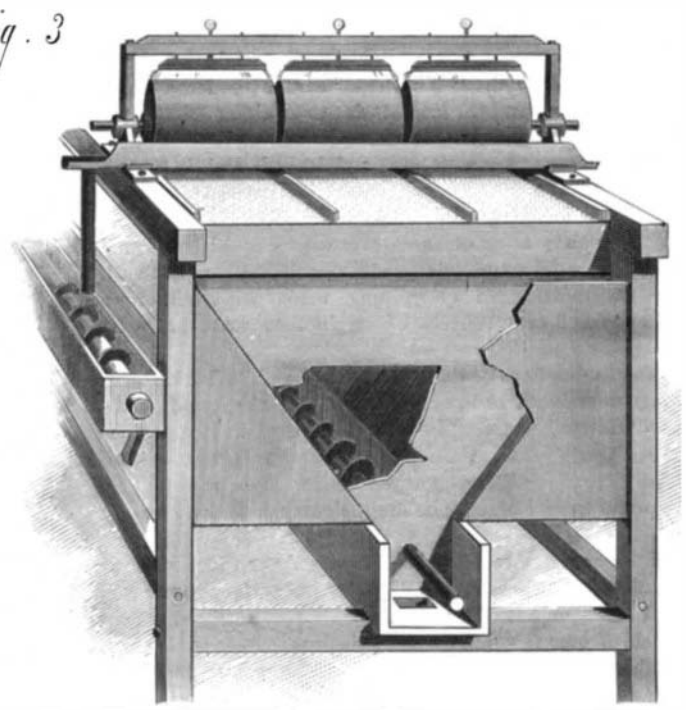
In dispensing with the use of air blasts, there is no possibility of filling the air of the mill or any part of it with explosive starch dust, and the serious problem of insurance is thus materially simplified. With the source of hazard removed the excessive rates charged for insuring flour mills would be unnecessary.

Taking into account, therefore, the great saving in cost of machinery, in power required, and in space; the more rapid action of the bolts since the material meets with no resistance in passing through the meshes; the more perfect separation of the bran from the flour products; the diminished waste; the fewer processes required to achieve a given result; the diminished fire risk from the absence of dust; the great simplification of the work of milling promised by electric purification and the possible increase in the capacity of mills, the new system can scarcely fail to meet with immediate attention if not favor at the hands of progressive millers. To those operating custom mills, it seems to offer especial advantages, since it makes possible the conversion of grain in small distinct lots into new process flour, giving each customer his own.

The ultimate importance of the new system, if wider application sustains the promise of its performance hitherto, must be enormous. Our annual wheat crop is equivalent to something like 100,000,000 barrels of flour. The proprietors of the Atlantic Mills say that, "after making all allowances and reductions, we estimate the saving in material alone effected by the electric purifier to be at least 10 cents on a barrel of flour, wheat being at present $1.20 per bushel." By this estimate, the saving of material in milling a year's crop of wheat would be $10,000,000, and this is but one of several savings made possible by electric purifying over purification by air blasts and the machinery now in use.

Little needs to be said in explanation of the detail illustrations, which tell their own story. Fig. 2 shows very clearly the appearance of the bran as it leaps from the sieves and clings to the rolls. The adhering bran is brushed off when it reaches the sheepskin cushion, which lightly touches the top of the roll to electrify the hard rubber. The bran trough in front of the roll has been omitted, to show the behavior of the bran more clearly. Fig. 3 shows the tail of the purifier broken, to expose the shoot for the tailings and the spiral conveyor further in, by which the several grades of middlings are conveyed to their respective delivery spouts.

Fig. 3



End of Purifier broken away to show Middlings Conveyor and Tailings Spout.

ELECTRIC MIDDLINGS PURIFIER.

The Smith-Osborne patents for this process of purifying middlings are owned by The Electric Purifier Company, of New Haven, Mr. John Rice, General Manager. New York office, 17 Moore Street.

MECHANICAL INVENTIONS.

Mr. Evan T. Davies, of Manistee, Mich., has patented a sorter for separating lumber as it comes from a sawmill into different grades, and depositing each grade separately or upon its own wagon, thus avoiding handling the lumber.

Mr. Simeon Nichols, of Lisbon, Me., has patented a simple and convenient device for adjusting the elevation of the coupling link and for coupling and uncoupling cars without going between the cars for that purpose.

An improved combination wrench has been patented by Messrs. Edward M. Butler and William H. Campbell, of Cleburne, Texas. The object of this invention is to provide a wrench whose movable jaw is adjustable without a screw, and with whose handle are combined several useful tools or instruments.

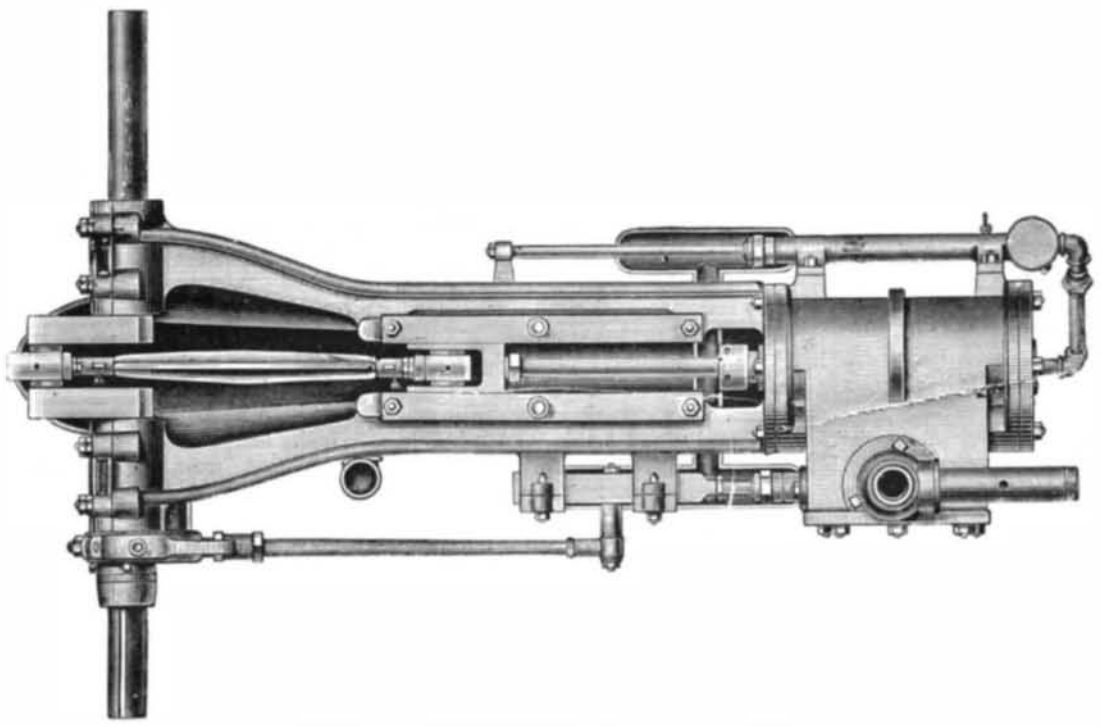
An improved car truck has been patented by Mr. Franklin Beaumont, Jr., of San Antonio, Texas. The improvement consists in providing the lateral guide wheels with long axles which are inclined at an angle of about 45 degrees to the axles of the ordinary truck wheels, and in providing the bolsters of the truck with a central opening, and otherwise constructing it with a view to attachment of such inclined axles.

An improved mill for reducing grain has been patented by Mr. Edward L. Baker, of Red Wing, Minn. This invention is designed to accomplish the disintegrating of grain in milling as is now usually done on grooved iron rolls by a mill or machine applicable to all old style mills without

change in their construction, adapting them with little expense from low grinding to high grinding, or Hungarian mills, thereby increasing their capacity and usefulness. It is designed, also, to make the best quality of flour while making the greatest possible amount of middlings in disintegrating grain, and to be applied in and take the place of the ordinary French burr stone now in use.

STATIONARY AND PORTABLE ENGINES.

The requisites of a good engine are that it shall be self-contained, simple in its design and construction, direct in its action, having its bearing surfaces ample and all of its parts accessible, beside being so proportioned and constructed as to yield the best results from the steam furnished to it. These important features are possessed by the engine which we illustrate herewith.



SKINNER & WOOD'S STATIONARY ENGINE.

The frame of this engine is cast in one piece with the front cylinder head and main shaft boxes, and the center line of the bed lies in the same plane with the line of centers of the engine, thus insuring direct action and avoiding the evil of getting out of line so common to engines having their different pieces bolted to the bed. The bearings are of unusual size, and all of the moving parts are made adjustable, so that any wear may be readily taken up without throwing any of the parts out of line. The guides and crosshead are particularly well arranged in this respect. Every engineer or owner of an engine likes to have his engine and boiler clean and bright. In this engine particular attention is given to the arrangement of the different parts so as to render this convenient. Drip pans are provided which receive any oil and water which may drip from the pump or other parts, and conveys it away through a single pipe.

The pump is driven by the crosshead, and has interchangeable brass valve seats. It is arranged so that all parts may be examined without disturbing the rest of the engine. The stop valve placed between the pump and boiler is contrived so that should the pump be started with this valve shut no damage can be done to either pump or valves, as communication between the pump and atmosphere is established when the stop valve is closed. This is a very simple and effective arrangement.

The engines are provided with safety stop governors, which prevent the engine from "running away" should the governor belt be broken by any accident, or slip off. These and many other good points are found in this engine.

The portable engine is in all respects like the stationary, and its boiler is of the best design for safety and durability. They are complete, self-contained, manageable, and safe.

These engines are made in various sizes, from 5 to 20 horse power, by Messrs. Skinner & Wood, of Erie, Pa.

The Chicago Breakwater.

On January 12, 1881, the Board of United States Engineers decided upon the location for the proposed exterior breakwater of Chicago. The construction of the new, exterior, or detached breakwater, will be commenced this spring. It will be about 5,400 feet in length and 30 feet wide, having a direction of about E. S. E. Its westerly end will be at a point 4,850 feet due north of the east (or outer) end of the present "North Pier," and its easterly extremity at a point 2,200 feet north, by 4,700 feet east from the above mentioned point on the north point, or 4,200 feet south by 1,100 feet west of the water works crib. This work will be done by hired labor, and materials furnished by contracts, with Major G. J. Lydecker, Corps of Engineers, U. S. A., as the U. S. Engineer in charge. It will be formed of cribs 100 feet in length and sunk directly upon the bottom, no piling being considered necessary, as examinations give a clay bottom covered with a shallow stratum of sand and stones. —*Amer. Engineer.*

New Geysers in Montana.

According to the *North Montana River Press*, two new geysers have appeared in a strip of that Territory known as "Sag." The first was seen about a month ago, but has only lately assumed remarkable proportions. It is situated in a small cañon running out from the wall of rocks on the east of Alkali Lake, and throws up a jet of hot water and steam over a hundred feet high. The height of the other geyser is only fifty feet, but the diameter of the spout is larger. The geysers are, of course, intermittent, and seem specially active in the morning. The formation of the country is a sandstone and gneiss, and has all the appearance of being an ancient river bed.

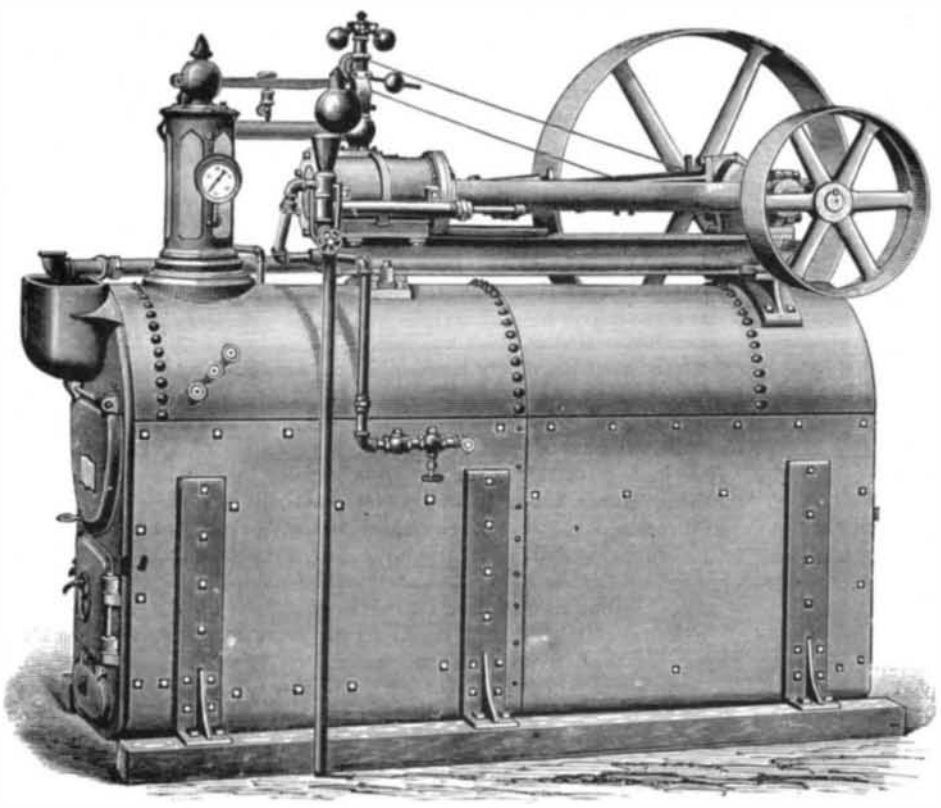
MISCELLANEOUS INVENTIONS.

An improved cabinet has been patented by Mr. John Sorenson, of Leavenworth, Kan. The object of this invention is to construct cabinets and other articles of furniture without nails, screws, or glue, so that they can be knocked down and packed in small compass and easily set up again for use.

An improved millstone-dress has been patented by Mr. Burrell C. Lambeth, of Thomasville, N. C. The object of this invention is to dress a millstone so that it will run with less friction at the skirt, will be less liable to heat or choke, and will grind faster and more evenly, and keep in face longer than stones dressed in the ordinary way.

Mr. Sidney Crowley, of Manchester, County of Lancaster, England, has patented a heel plate provided with a central screw perforation and projecting studs upon the upper surface.

Mr. Isaac Heine, of Leipsic, Saxony, Germany, has patented an atomizing tube that can be bent into any desired shape, which it will retain. The invention consists in constructing an atomizing tube of such materials as may allow it to be flexible, to remain in any desired position, and at the same time prevent the vapor from coming in contact with the metallic constituent of the tube.



SKINNER & WOOD'S PORTABLE ENGINE.

An improved sunshade-fan, which is simple and can be folded very compactly, and may be used as a fan or as a sunshade, as may be desired, has been patented by Mr. James H. Dennis, of Newark, N. J.

Mr. Samuel May, of Toronto, Ontario, Canada, has patented a billiard-table cloth covered on one side with a coating of India-rubber, to prevent the dust from passing through the cloth and gathering upon the table.

A simple and effective device, designed especially for use in sprinkling cotton plants with poisonous solutions, to protect them against the ravages of injurious insects and worms, has been patented by Mr. Alois J. Polansky, of Fayetteville, Texas. The invention consists of a portable force pump provided with a capacious air chamber, and having on the end of its discharge pipe a sprinkler of novel form, which causes the liquid to be ejected in fine spray.

An improved grain meter has been patented by Messrs. Reuben R. James and Mirabeat N. Lynn, of Rising Sun, Ind. This invention relates to apparatus for weighing and measuring and registering the amount of grain that passes through it by means of apparatus actuated solely by the weights of the grain, and thereby be automatic in its operation; and the improvement consists in employing double-balanced measuring buckets suspended from a balance beam that is supported upon a vibrating lever operated upon alternately by the weight of the grain in one of the buckets, and the weight of a scale beam connected with the free end of the vibrating lever, to hold the receiving bucket in its raised position until the proper weight or quantity of grain shall have been delivered to it, when it will be allowed to drop of its weight at once in a peculiar manner, and in so doing close the receiving valve and open the discharge valve connected to the full bucket, to allow the grain to discharge therefrom, while the other measuring bucket is by the same movement raised and acts upon its receiving and delivery valves—to respectively open the one and close the other, and become, in turn, the receiving bucket—the operation above described to continue so that one bucket will operate upon the other so long as grain is allowed to pass the receiving valves.

Artificial Indigo.

The following is Bäyer's synthetical process, described by himself: I take orthonitrophenylpropiolic acid, and in the cold I mix the said acid with sulphuric acid, as, for instance, with from about ten to twenty parts, by weight, of sulphuric acid, of about 1·84 specific gravity to every one part, by weight, of orthonitrophenylpropiolic acid employed. In effecting the said mixture care is to be taken to avoid a considerable rise of temperature, say, 20° Cent. The mixture thus obtained quickly assumes a bright yellow or orange color, and the reaction is allowed to proceed in the cold until a sample of the mixture, upon being tested for the presence of orthonitrophenylpropiolic acid by means of glucose and alkalies, no longer contains any appreciable quantity of the said acid. The sulphuric acid mixture thus produced is then submitted to the action of suitable reducing or deoxidizing agents in order to effect the conversion into artificial indigo. In practice I have found a great number of substances belonging to various classes of chemical compounds which act as deoxidizing agents upon the above-mentioned new product, and I may especially mention ferrous sulphate (green vitriol, copperas). As an example of the manner in which I prefer to conduct the aforesaid operation, I take the orange colored mixture resulting from the treatment of one part, by weight, of orthonitrophenylpropiolic acid with about from ten to twenty parts sulphuric acid, as above described, and I mix the same with a solution containing about five parts, by weight, of ferrous sulphate. The mixture is then allowed to stand at the ordinary temperature until the blue color, which it quickly assumes, is fully developed, and the dyestuff or coloring matter thus produced may be separated out of the mass by diluting the result of the operation with water, by which the new dyestuff is precipitated, and may be filtered and washed. The dyestuff is then ready for use. The characteristics of my new dyestuff or coloring matter, prepared according to the above process, are the following: The dyestuff or coloring matter resembles in appearance vegetable indigo, and it can be used in dyeing in a manner similar to it; but it is in a great part soluble in aniline at an ordinary temperature, and also in an aqueous solution of sulphurous acid.