and will thus get rid of the charcoal dust, so injurious to the health of the workmen.

The expenditure of water or steam may be estimated by considering the surface of the caoutchouc as the surface of a piston, and its depression joined to that of the printed surface as the stroke of the piston; consequently, when the basin is one metre square, there is an expenditure of one litre of air or water for each millimetre in the depression of the surface.

Water appears on the whole the most desirable agent, on account of its non-compressibility and of the small quantity required in order to produce very considerable pressure, as also on account of its non-expansibility, which prevents the possibility of an explosion, for if any breakage takes place the water simply runs out. In experiments which were made with a pressure of from 20 to 30 atmospheres, before perfecting the press, the vessel repeatedly burst with no greater injury to those engaged than a few splashes on their clothes.

Coloring Matters.

In view of the excitement which has recently ensued upon some reported cases of accidental poisoning from the use of arsenical colors on stuffs and paper-hangings, M. Salvetat calls attention to the possibility of producing cheap and permanent greens, pinks, and violets from common metals. He enumerates the following:

Chrome-greens—Prepared by calcining together the sesqui-oxide of chromium, hydrated alumina, and the carbonate of cobalt in an oxidizing atmosphere. The proportions vary with the color desired. Blues may also be obtained in the same way.

Hydrated Oxide of Chrome.—This magnificent color has long been used by the painters under the name of *emerald green.* It is also sometimes called *Pannetier-green,* from the name of its introducer. The following mode of preparing it has been patented in France by M. Guignet:—Calcine, carefully, to redness a mixture of bi-chromate of potassa and crystallized boracic acid; a green mass is obtained which is a borate of chromium and potassa. In contact with water this salt decomposes; boracic acid dissolves, and the hydrated oxide of chrome remains precipitated. The proportions recommended are 10 parts by weight of the crystallized acid ($BO^3 \cdot 3HO$,) to 3 parts of bichromate $KO \cdot 2C \cdot O^3$, which by theory should give 2 parts by weight of the hydrated oxide.

The tone of the color may be varied by the mixture of alumina. The tone of the emerald green corresponds to green 4, 12th tone of the 1st chromatic circle of M. Chevreul.

Cobalt-Pink, and-Violet.—When a solution of a cobalt-salt is precipitated by the phosphate of soda, we obtain a pink-salt of a very beautiful tint, which, when simply dried in the air, corresponds to 1st red-violet, 5th tone of the 1st chromatic circle of M. Chevreul. It is known that under the influence of heat the oxide of iron takes a tint which varies from orange to blue-violet, according to the temperature to which it has been exposed. The phosphate of cobalt presents a similar property; and according to the temperature to which it has been exposed, its tone varies from red-violet to the 2d blue-violet. We may thus obtain any intermediate tint from the 3d violet-blue to the 5th violet and red-violet. The violet, 11th tone, corresponds to the fused phosphate of cobalt. The 4th violet-blue, 10th tone, corresponds to the aluminate of cobalt and chrome. These tints will be purer in proportion as the heat has been uniform throughout the whole mass.

As the oxide of cobalt may now be obtained at a reasonable price, it is to be hoped that these new mineral colors may be serviceable for printing on stuffs and paper, and especially for the preparation of fine colors for painters.

Nickel-yellow.—The phosphate of nickel, which, when merely dried at ordinary temperatures, is of a greenish-white color, becomes yellow by exposure to a red heat. This may give us a new fixed yellow for similar purposes.—*Academy of Sciences of Paris, Feb.* 7, 1859.

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*On an Expanding Pulley for Obtaining Variations in the Speed of Machines with facility.** By JAMES COMBE, Belfast.

A pretty correct idea of this pulley may be formed by supposing two cones cut with radial spaces alternating with solid parts, so that the solid parts in one may slide freely into corresponding spaces in the other, in the direction of a common axis. The sizes of these radial sections are regulated so that when the two cones are put together they form a grooved or V pulley, the diameter of which varies according to the position which the cones occupy with regard to each other. This will be at once apparent by an inspection of the engravings. It will also be seen that any desired amount of variation in size may be got, and this without involving the necessity of occupying a large space. This change in size is made by pressing the one into the other, which can easily be done whether the pulley be in motion or at rest. The value of the property of giving readily any amount of change in size will be made evident by a comparison of the results obtainable by a pair of common cones and a pair of expanders of similar dimensions, and giving the same extremes of speeds.

A range from 1 to 4 in diameter (or more if necessary,) is easily obtainable in the expanders, and, supposing the one which drives to have a speed of 80 revolutions per minute, and that it be set at 4 ins. diameter, and the one which is driven to be set at 16 inches diameter (the corresponding position), the speed of the latter will be one-fourth of 80, or 20 revolutions per minute.

When the driver is changed to 16 inches in diameter, and the driven to 4 inches, the speed of the driven shaft will be increased to 320 revolutions per minute.

The changes between these extremes (20 and 320,) may be of any

* From the London Mechanics' Magazine, October, 1858.