

**IMPROVED THREE-CYLINDER ENGINE.**

We give engravings of a new pattern of three-cylinder engine constructed by Mr. Jabez James, London, the engine being one designed and patented by Mr. James in conjunction with Mr. Walter Wardrope. The special features of the engine are the arrangement of the valves and ports, and the manner in which the valves are driven.

Referring to our illustrations, it will be seen that the engine has three single-acting cylinders, each of which is provided at its outer end with a short straight port leading to the corresponding valve casing. The slide valves are piston valves, and the cylindrical casing in which each valve works communicates at its outer end with the exhaust, while the central portion of its length is in communication with the steam supply. In addition to the port just mentioned, the opening and closing of which is controlled by the valve, each cylinder has other exhaust ports, so placed that they are uncovered by the piston when the latter has made about five-eighths of its stroke toward the crank-shaft; these supplementary exhaust ports are shown dotted in Fig. 1, and in section in Fig. 2, from which their arrangement will be readily understood. These supplementary ports permit of the escape of a large proportion of the steam, as the piston, after having uncovered them, moves but slowly, so that they are left uncovered during a considerable fraction of the revolution. As will be seen from our engravings, the exhaust steam enters the engine casing in which the crank revolves, and finally escapes at the bottom to the exhaust pipe.

The manner in which the valves are driven will be readily understood from Fig. 1, from which it will be seen that each valve is driven by a rod connected to the piston next in the rear of it, the engine illustrated being arranged so that, looking at it as in Fig. 1, the crank-shaft would rotate in the direction of the hands of a clock. It will be noticed that the arrangement of valves and steam passages adopted allows of the connecting rods being made long, without causing any increase in the clearance spaces due to lengths of steam ports.

The crank-shaft has very long bearings on each side of the crank, and also a very long crank-pin bearing as shown in Fig. 2, so that the engine is well adapted for high speeds. Power can be taken off either end of the crank-shaft, and the arrangement allows the engine to be accurately balanced. One of these engines, shown at work lately at Mr. James's factory, ran exceedingly smoothly and steadily. This engine has 6-inch cylinders and 6 inch stroke, and is capable of being worked up to 40 indicated horse power; at present, however, it has been worked up to 16 horse power only, on account of an insufficient steam supply. The engine illustrated is fitted with single slide valves only, but the engines are also arranged to be fitted with expansion gear constructed on the compound system. In another arrangement adopted the valve rods, instead of being coupled to the pistons, are coupled to the connecting rods, it being thus possible to vary the cut-off within wide limits without incurring complication.

—Engineering.

The great iron bridge of the Atlantic and Pacific Railroad over the Cañon Diablo, in Arizona, has recently been completed. It is 500 feet long, the cañon being some 250 feet deep. The height of the bridge is 240 feet, or 14 feet higher than Bunker Hill Monument. The weight of the bridge amounts to something like 800,000 pounds, and the cost of construction was \$300,000.

**The Thomson Ferranti Dynamo-Electric Machine.**

The new machine of Sir William Thomson and Mr. Ferranti consists simply of a wavy or gridiron-shaped ring of copper revolving between two sets of electro-magnets. There is no commutator, as in other machines, and the cost of construction is much reduced. It is stated that the experimental trials have shown that 12 (20 candle-power) incandescence lamps can be produced per horse power. It is further remarked that the Thomson-Ferranti machine is superior to that of "Brush," in the proportion of 12 to 34,

venient to the operator. The arbors are steel, running in Rowley & Hermance's patent journal box, which is made in three parts, taking up side as well as top motion, thereby allowing this machine to do very smooth work. The heads are also of steel, the top head being slotted on four sides; the two side and the bottom head are slotted on two sides. The top head-stock has a lateral adjustment, and by a novel device the outside head-stock can be set at any angle desired and fastened, and then moved out or in or up and down accurately while the machine is in motion. The inside head-stock has a horizontal adjustment. There is a slide fitted into the table that can be moved to and from the under cutter-head, so as to allow cutters to project through the face of the table and act as a chip breaker.

The patent hood over top cutter-head is adjustable to and from the cutters to allow long knives to be used on head, and the hood is weighted to act as a combined pressure shoe and chip breaker. The frame which holds the hood is hinged, and has a swivel or circular motion, and can be thrown entirely out of the way to give the operator free access to cutter-head. There are two adjustable yielding pressure shoes for holding the stuff firmly to bed while being worked.

These machines are made by Messrs. Rowley & Hermance, Williamsport, Pa., who also manufacture mortisers, tenoners, and different sizes of moulders; also sash, door, and blind machinery.

**Artificial Wool from Vegetable Fibers and Wool.**

E. Stutzer, in Berlin, has devised a method for making artificial wool by mixing wool with vegetable fibers like flax, hemp, jute, etc., so that it will have a beautiful silky luster, and both the wool and other fiber will take the same colors.

It is well known that in bleaching and dyeing, fibers of vegetable origin require an entirely different treatment from those of animal origin. Hence it was necessary, when colored wool was to be mixed with other colored fibers, to dye them separately, for if the mixture was dyed the different fibers would take different colors in the same bath.

Stutzer found that this unequal dyeing was due to a gummy substance found in the cells of the plant fibers, and his

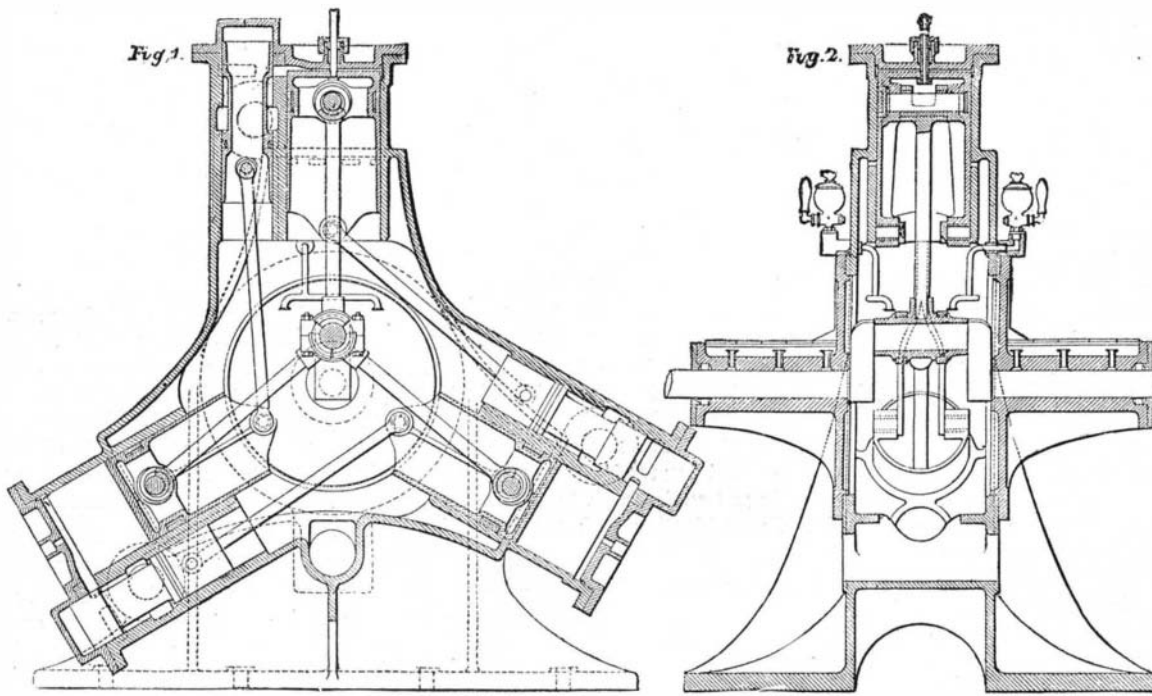
process is intended to entirely remove this substance. In a vessel capable of holding about a hundred gallons, and filled about two-thirds full of water, he puts 220 lb. of the stuff and adds caustic alkali, and afterward some soap. The liquid is heated to 175° C. (347° Fahr.), by means of a coil of steam pipe in the bottom of the vessel, and the materials boiled half an hour. At the end of this time they are taken out, washed, and rinsed, and then put in a second bath containing 62 parts ammonio-sulphate of copper to 2,000 of (carbonate of) soda, or twice the quantity of the former without the latter. The goods are boiled in it for half an hour, washed, rinsed, and dried. If the goods are to be very soft the last bath is omitted.

When silk is to be mixed with vegetable fibers a similar difficulty is met with in dyeing the mixture. Agache & Imbs, in France, overcame this difficulty by softening the vegetable fibers in an

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emulsion of animal oils with a soda solution, and then piling them up in heaps till a fermentation takes place. The plant fibers are mordanted in this way, and when mixed with waste silk can be spun like flax, wet or dry.

MEDITERRANEAN fishermen complain that their sea, formerly free from sharks, is now infested with them. The sharks come through the Suez Canal from the Red Sea and the Indian Ocean, and make sad havoc among food fish.

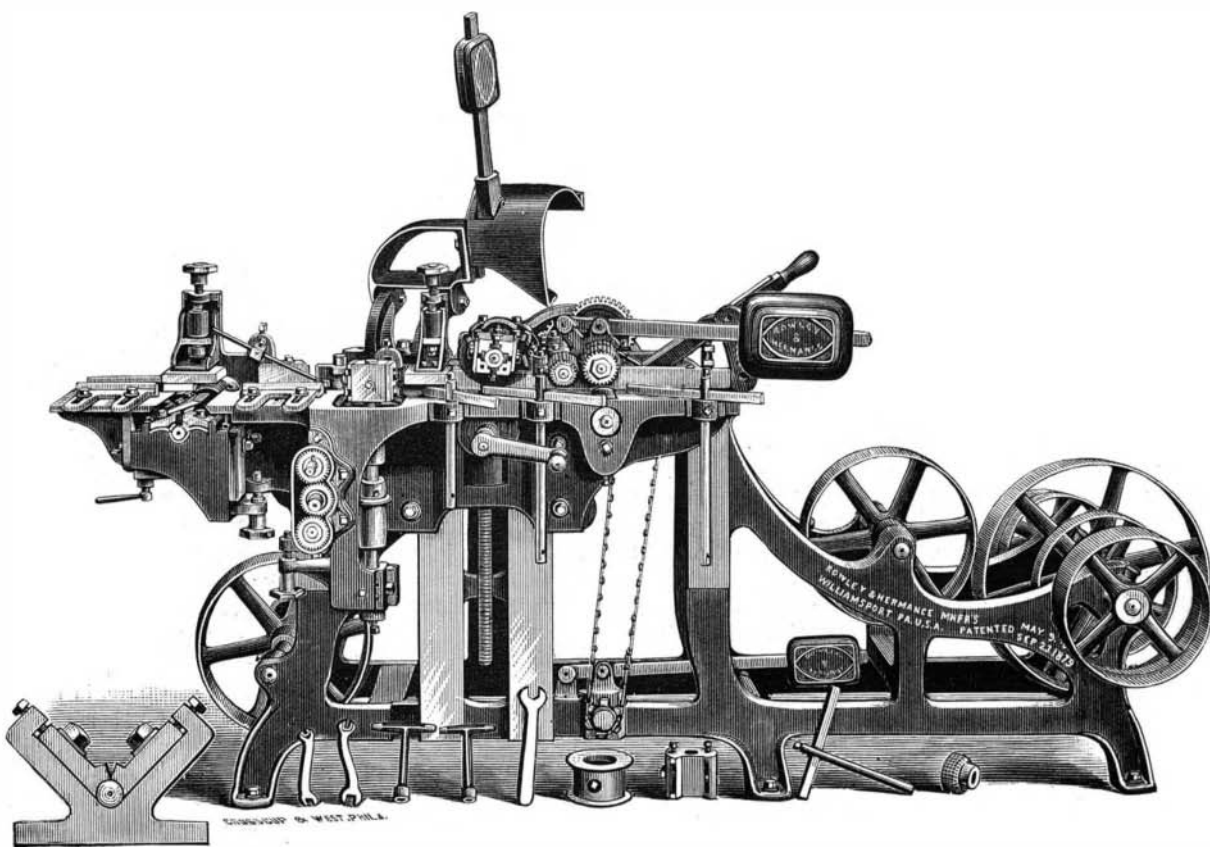


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or in other words, that the power required to produce 12 lamps of 20 candle-power each by the Brush system is, roughly speaking, about four times greater than that necessary to give the same result in the former. The electro-magnets of the new machine are intended to be excited from a separate source. Mr. Robert Hammond states that one of the new machines will light five times as many incandescent lamps as any other machine.

**NEW FOUR-SIDED MOULDER.**

With moulding machines heretofore made the principal fault has been that the feed works were not strong enough to carry the work through the machine, the operator being obliged to crowd the stuff, especially when it is a little damp. This is not only annoying to the workman, but expensive to the proprietor, on account of time lost.



FOUR-SIDED MOULDING MACHINE MADE BY ROWLEY & HERMANC.

In this machine there is an entirely new device for gearing the under feed roll, making it a very strong feeding machine. The under roll is so geared that it feeds equally strong when the bed is lowered to fourteen inches, as when working thin stuff. This is an important feature in sticking door stiles and rails or other wide stock, and is peculiar to this machine. There are two upper feed rolls, one weighted, the other held firmly by springs. The frame is heavy and strong, being one solid casting. The table is raised and lowered with a crank on top of the machine, con-