

Toughened Filter Paper.

At a recent meeting of the Chemical Society a paper was read on "Toughened Filter Paper" by E. E. H. Francis. Filter paper which has been immersed in nitric acid, rel. den. 1.42, and washed with water, is remarkably toughened, the product being pervious to liquids, and quite different from parchment paper made with sulphuric acid. Such paper can be washed and rubbed without damage, like a piece of linen. The paper contracts in size under the treatment, and the ash is diminished; it undergoes a slight decrease in weight, and contains no nitrogen.

Whereas a loop formed from a strip one inch wide of ordinary Swedish paper gave way when weighted with 3 to 5 ounces, a similar loop of toughened paper bore a weight of about 3 pounds. The toughened paper can be used with the vacuum pump in ordinary funnels without extra support, and fits sufficiently close to prevent undue access of air, which is not the case with parchment paper. An admirable way of preparing filters for the pump is to dip only the apex of the folded paper into nitric acid, and then wash with water; the weak part is thus effectually toughened.

THE "VULCAN" CUSHIONED POWER HAMMER.

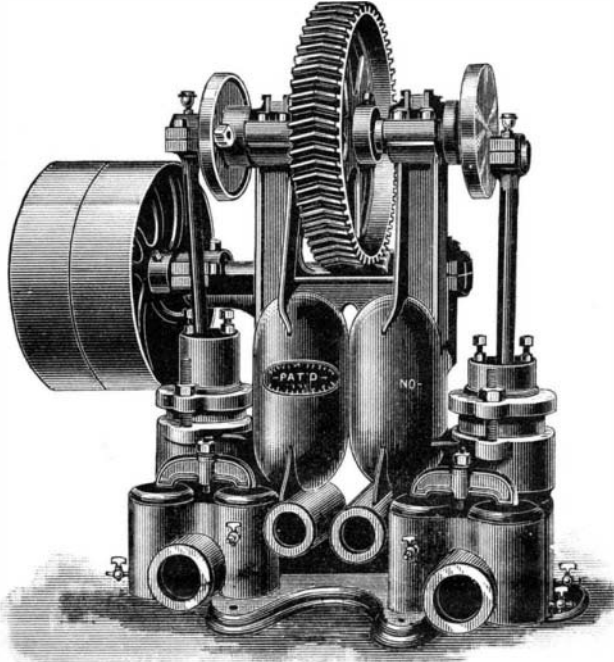
The hammer herewith illustrated presents several important features to commend it as one of the most useful of American machine shop appliances. The improvements it embodies are such as will be at once recognized by a hand accustomed to the use of power hammers, or who has had experience in the stamping out of work with dies, a branch of machine construction which is every day finding new channels of development. Its special adaptation for die work is a consequence of the fact that the ram moves in permanently fixed vertical slides, whereby it must necessarily descend each time in the same place, and deliver a true and square stroke. Perfect elasticity of stroke, with cushioning, are obtained by means of four rubber cushions, mounted above and below the fulcrum bearing of the helve, which is a solid steel forging, so that the latter is, in fact, mounted on elastic bearings. The effect of this arrangement is to almost double the stroke of the ram and produce a quick, sharp, and elastic blow. The ram, rebounding instantly, does not in the least chill the iron, as in the case of hammers resting on the work. The hammer, being constructed on the dead stroke principle, the helve is connected to the crank shaft by a connecting rod, the length of which may be adjusted by means of a right and left hand nut, so that the distance between the dies can be quickly increased or diminished, as desired. The force of the blow can be completely controlled by means of the treadle. The machine is built entirely of iron and steel, with the exception of the rubber cushions and the necessary brass work. This design makes it superior to any modification of the trip hammer, it being impossible, when the helve works on fixed pivots, to forge square when the work varies in size; but, as will be readily perceived, it is impossible to forge out of square with this hammer, no matter what may be the size or shape of the work, unless the dies are specially made. Expensive foundations are not needed, since the anvil is heavy enough to receive the force of the blow.

The perfect ease with which this hammer can be operated by the most ordinary workman, its simplicity of construction, and the rapidity with which a large class of work can be turned out with its help, are points which have been already well attested in a practical way in leading machine shops. It is adapted for all kinds of forging and die work, such as edge tools, agricultural implements, springs, machine forging, file makers, tool makers, etc. In the making of all these classes of goods, the exactness with which the hammer can be made to do its work, and the nicety with which its action can be controlled, are points which largely affect the amount of subsequent labor necessary in the finishing, as also the ultimate quality of the goods, and in these respects the hammer shown in the accompanying engraving has elements of superiority which practical men will unhesitatingly concede. The manufacturers of the Vulcan hammer are Messrs. W. P. Duncan & Co., of Bellefonte, Pa.

DR. EDWARD VANDERPOOL, of New York, recommends Fowler's solution of arsenic in neuralgia of the stomach, in six to ten drops three times per day. His experience with it appears to have been highly satisfactory in the cases reported.—*Independent Practitioner*.

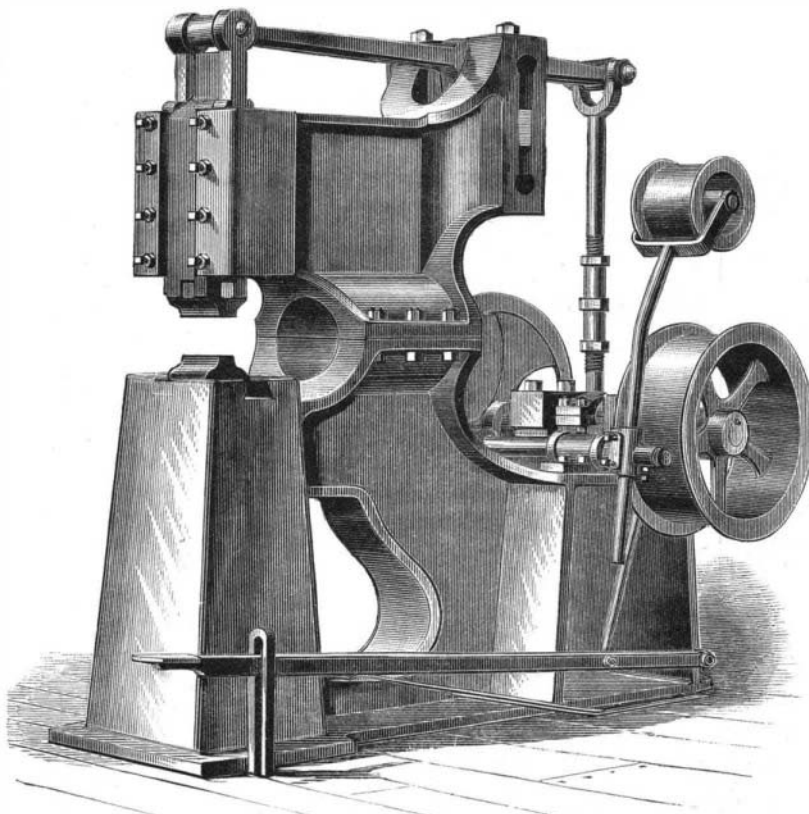
DOUBLE PLUNGER GEARED PUMP.

The accompanying engraving represents a well designed and durable pump for feeding boilers or tanks, and for use in tanneries, paper mills, breweries, etc. The pulley shaft is mounted horizontally about in the center of the frame, and carries a pinion meshing with a large wheel journaled in the upper ends of the frame

**DOUBLE PLUNGER GEARED PUMP.**

standards. Owing to the form of teeth used, the action of these wheels is exceedingly smooth and noiseless, and the wear upon the contact surfaces is reduced to a minimum. The strength of the pinion teeth is increased by side flanges. At each end of the main shaft is a disk crank, finished on edge and face, and provided with steel crank pins made large to decrease the wear. The connecting rods are united to the crank pins by a cap and box, so that all wear can be easily taken up when necessary, and are fitted with brass oil cups. The lower ends of these rods are connected to the center of the plunger by a new device, designed by the makers of this pump, by means of which wear can be taken up by simply screwing up set bolts on the upper end of the plunger. The suction and discharge pipes, which are tapped to standard pipe threads, are clearly shown in the cut. There are similar openings for discharge pipes on the opposite side of the pump.

The air chambers are large, and are so disposed as to form part of the frame supporting the pulley and crank

**THE "VULCAN" CUSHIONED POWER HAMMER.**

shafts. The valve seats—both the valves and valve seats are made of bronze metal—are screwed into the valve chamber. The removing of one nut permits both the suction and discharge chambers to be examined. The bracket supporting the pulley shaft is so formed that it can be placed at either side of the frame, as may be found most convenient in setting up the pump.

Practically, the machine consists of two separate pumps, which may be operated together or singly, and which may be used to pump different liquids at the

same time. Both shafts are of steel. All the journals have oil boxes with covers to keep out dust and grit from the oil holes. The body of the pump and valve chambers have drain cocks, so that the pump can be thoroughly drained in cold weather. The pump is compactly and strongly built, occupies but a small space considering its capacity, and all its wearing parts are large and well proportioned, insuring easy running and durability. The journals are made large, and are filled with No. 1 Babbitt metal. Additional particulars can be obtained by addressing the manufacturers, the Stewart Heater Company, of 40 & 42 Clinton Street, Buffalo, N. Y.

The Phelps Induction Telegraph.

A most interesting, as well as wonderful, experiment in telegraphy was successfully tried recently by the B. & O. Telegraph Company officials. They succeeded in telegraphing on a railroad track while going at the rate of 40 miles an hour by the Phelps induction system. [This system was described in the SCIENTIFIC AMERICAN for Feb. 21 last.] The experiment was conducted by Mr. Phelps, the inventor, and under the direction of the B. & O. officials. Messrs. Joseph G. Pangborn, the Assistant General Passenger Agent, and Mr. McLaren, the Manager of the New York city B. & O. telegraph offices, went on the car, and Mr. Weaver, the B. & O. electrician, remained at the receiving office in New York. The experiment was tried on the Harlem River branch of the New York and New Haven Railroad.

Soon after the train was started, and while going at the rate of 40 miles an hour, the operator in the car called New York. A direct wire had been furnished through to Baltimore and into President Garrett's private office in the Central Building in this city. The gentlemen in the car awaited the answer with anxiety. Soon the instrument began ticking as loudly as if in a stationary office. New York had responded. The induction system worked. Major Pangborn then incited a telegram to President Garrett, saying that the Phelps induction system was a success. The telegram went direct to Mr. Garrett, and an answer was received by the experimenters on the car: "Your telegram has been delivered to President Garrett in his private office." Major Pangborn then wrote another: "President Garrett, I am telegraphing to you, on a train going 40 miles an hour, by the Phelps induction system. The wire in our car is 7½ in. from the wire laid on the ties of the track." While the operator was sending the dispatch, Major Pangborn noticed that the train had gone its 12 miles, and that it would soon pass over the wire in the wooden trench. He said nothing, but let the operator continue. The train left the box behind. As it passed over the end there was a fainter sound of the ticking of the instrument, but the message continued. The induction was

so strong that the current had gone to the wire on the telegraph pole 40 ft. from the track. It seemed marvelous to the experimenters. Sitting in a car with no wire nearer than 40 ft., and to send and receive messages! When the train returned the experiments were continued, and it was found that the inductor worked as well as on the other track. The message was sent over the wire in the wooden trench on the other track, 11 ft. away. Of course there was a difference in the sound from the one received and sent when the car was over the wire and when 11 ft. from it. On the return the telephone was connected with the induction system, and a message on a wire 60 ft. away was heard. The sender was in New York; and he was sending a message to his wife in New Rochelle: "I will not be home to-night. Business detains me in the city."

Mr. Phelps stated that a system of bells could be placed on the engines and worked by the induction system, so that trains could telegraph to each other, and a system arranged so that when trains were within 1,000 ft. of each other a bell would ring, announcing the number of the train ahead.—*Baltimore American*.

GALLIUM.—Dr. L. Ehrlich, a German chemist, has succeeded in isolating the metal gallium by an industrial process. A preliminary experiment has yielded 0.6 grain of gallium from 80 kilogrammes of zinc blende. The method followed was a modification of that introduced by M. Lecoq de Boisbaudran, which by lixiviation of the zinc sulphate resulted in a small quantity of mud containing ferric oxide and gallium. The galliferous alkaline solution was then electrolyzed in a platinum capsule, and the metal deposited in fine needles. As the melting point of gallium is low, about 30.5° C., and its luster brighter than that of mercury, it may be found of useful application by and by.