PRACTICAL MECHANISM.

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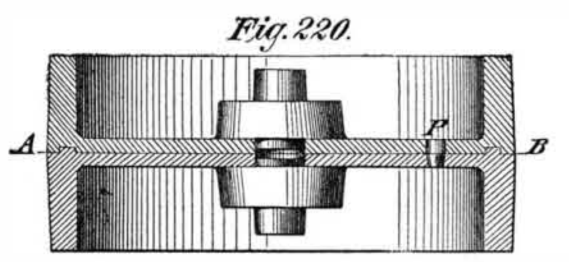
PATTERN-MAKING.—PULLEYS.

For the sake of durability, patterns for pulleys are generally made of cast iron. For convenience in moulding, it is usual to make them in halves, as shown in Fig. 220, A B being the line of division; the hubs are of wood, as they frequently have to be changed to suit different sizes of shafts.

We may commence by building up a wooden pattern for half of the rim, making it of such a size as to allow for its being turned by the machinist after being cast. Two castings having been taken from this pattern, they are bored and turned to equal dimensions, the proper draught for moulding being given in the process. A slight projection is turned upon one half, fitting into a recess on the other as shown at B. When placed together the two halves form the whole rim. The cast iron arms may be made either the full thickness or in halves. If made the full thickness they will be fixed to one of the half rims. As half the thickness of the arms is made to project beyond the half rim, it will form a guide to keep the two rims central, so that in this case the projection shown at B need not be made. The arms are fitted to the ring by turning, and at the same time a hole is bored through the center to form a guide for the hub, as shown at P in the cut. When the arms are cast in two halves, and a half fitted in each rim, the pattern is easier to mould, as a level parting is secured. The rims must not only be kept central but be prevented from turning one on the other, hence the necessity for the hole to contain a pin, as shown at P. For convenience in drawing the pattern out of the sand, a

Fig. 220.

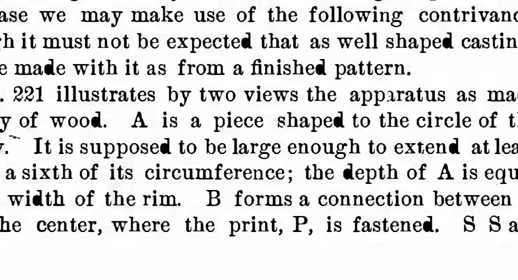


couple of holes may be bored and tapped three eighths or half an inch, or larger if thought necessary, near the rim, diametrically opposite each other.

Occasions often occur when it is inexpedient to go to the expense of a pattern for making a pulley, especially if the pulley be large and only one or two castings required. In this case we may make use of the following contrivance, though it must not be expected that as well shaped castings can be made with it as from a finished pattern.

Fig. 221 illustrates by two views the apparatus as made wholly of wood. A is a piece shaped to the circle of the pulley. It is supposed to be large enough to extend at least about a sixth of its circumference; the depth of A is equal to the width of the rim. B forms a connection between it and the center, where the print, P, is fastened. S S are

Fig. 221.

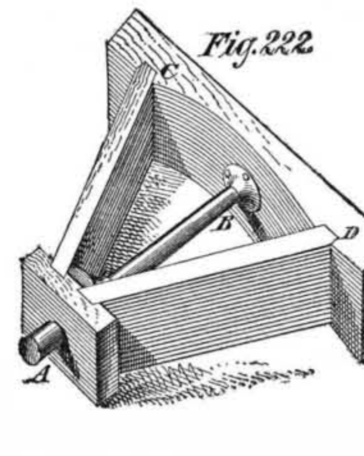


simply braces to stiffen the frame, the use of which will presently be described.

A core box must now be made embracing a section of the interior of the pulley. If the pulley is to have six arms, the core box will take up a sixth of the interior, if four arms, a fourth. We will suppose the pulley is to have six arms. The core is made as shown in Fig. 222. A B represents the arm of the pulley passing through the center of the box; from C to D is exactly a sixth part of the inner circumference of the rim. A sixth part of the hub is fixed in the other corner. The piece, C D, is loose at the joints, as it is necessary to take it off to get out the core. The arm also is loose. When a core is made in this box the arm, A B, is first pulled out; then the piece, C D, is removed, and afterward the other pieces. The hollows around the ends of the arms may easily be formed by the core maker, or they may be formed in the box, as seen in Fig. 222. The hollow or fillet at the end of the arm near the center must be worked out solid with the arm itself, while that which is at the circumference is worked in a piece fixed to C D, the arm being diminished so as to center this piece without making a feather edge. A plain straight arm, oval in section, is the cheapest and most convenient for pulleys made in this way. It may, however, be curved like the arc of a circle, but not made S-formed, as it could not then be drawn out from the solid core.

The moulder, having prepared a level bed, places upon it the frame, Fig. 221, allowing the print to impress itself in the sand; a weight is then placed upon the frame to keep it in position while the sand is piled around the curve and made level at the full height of the same. The frame is then shifted, and the sand moulded in again. This process

Fig. 222.



is repeated until the circle of the pulley is finished. Into the mould so prepared must now be placed six cores made in the box described in Fig. 222, and also the core to make the hole for the shaft. The whole is then covered with a level cope, and prepared for the casting.

Improvement in the Manufacture of Sulphuric Acid.

Professor Post, in his new work *Ueber die Fortschritte der Chemischen Gross-Industrie*, says, in regard to this important manufacture, that there is scarcely any branch of chemical industry where the work has been going on more quietly than here, and to none have so many valuable contributions been made during the past year. In the manufacture of the sulphurous acid, the residues and waste products from various metallurgical operations are coming more and more into use, while the residues left from roasting pyrites are carefully worked over into metal or vitriol, or prepared for other uses as in purifying illuminating gas. Still, in view of the high price of pyrites abroad, many of the technical chemists there anticipate a period when they shall have to return to the use of sulphur. The Platten furnace for roasting pyrites dust is coming into more frequent use, while that of Gerstenhöfer seems to be losing ground. The latter, of course, still holds the field where ores that are apt to sinter or furnace products (like the lead products of Freiberg) are used, as there, in consequence of subsequent concentration, a certain amount of sulphur in the roasted product is required. In the Platten furnace sintering would be very inconvenient. Hasenclever's furnace for blende is exciting more interest, and a new modification of his sliding furnace for pyrites has also been introduced.

It is interesting to notice the practical use of sulphuretted hydrogen gas for the manufacture of sulphurous acid. This gas, which is often formed as a by-product, has hitherto only been a source of annoyance and injury. It is also important economically to observe the employment of compounds of oxygen and nitrogen obtained in the manufacture of aniline.

Probably the most important publication of the year on this subject was the prize essay of Brode on the Glover towers. In this he proves the utility of these towers even for dilute and comparatively cool sulphurous vapors.

The changes in the form of platinum apparatus employed to concentrate the acid are extending. The system of Faure and Kessler (whose apparatus is in use at the Peekskill Chemical Works, and in other places in the United States), has become better known, but the new forms of the old boiler have not been the only subjects of discussion. Post publishes a very interesting original communication upon "Changes in these Apparatus," too long for insertion here. He says: On the whole it seems as if more confidence was reposed in the latter than in that of Faure and Kessler, the introduction of which gave rise to the invention of the latter. Dr. Schott emphasizes the fact that there is the greatest tendency, in all branches of industry where distillation or evaporation is carried on, to lessen the capital invested in apparatus, and also the cost of running it. In the manufacture of spirits, too, the stills are much flattened. It seems as if Faure and Kessler had only intended to lessen the consumption of platinum by leaving off the helmet or head of the alembic, and reducing the platinum covering of the boiler, and in doing this they struck upon the idea of evaporating about four inches of acid in a shallow vessel shaped like a saucer. The helmet was replaced by a tall, broad, and well-cooled cap of lead. The advantages of a shallow stream of acid are noticeable in the larger quantity concentrated, smaller consumption of coal, and greater dilution of the acid distilled over (17° to 18° B.). Still, the necessity of frequent repairs and consequent interruption of the process interferes with its general introduction. Soon after the disadvantages of this apparatus became known, two European dealers in platinum, Desmoutis, Quenessen & Lebrun of Paris, and Johnson, Matthey & Co., of London, each came into the market with a boiler, the form of which showed that the two latter had made good use of the experience of the first-named inventors. To favor a strong evaporation and produce a dilute acid distillate, they retained the same form of kettle, then united with this was a systematic heating of the acid in the kettle, but many disadvantages of Faure and Kessel's dish evaporation were removed by restoring the platinum head.

In 1875, in Prussia alone, 51,881 tons of raw material were consumed in 19 factories, employing 836 workmen, and making 69,985 tons of oil of vitriol, worth $1,359,300. One tenth of the raw material consisted of metallurgical waste products.

Utilization of the burned pyrites is becoming more general in Germany. A number of manufacturers on the Rhine have united together to import pyrites containing copper from Spain, and have the burned product worked up into copper or its salts, in their factory at Duisburg. The burned pyrites of Schœnebeck, which are free from copper, are used to purify coal gas, either alone or after treatment with the manganese solution remaining from the manufacture of chlorine. It is also employed in making green vitriol to neutralize the sulphuric acid formed by the oxidation of the bituminous shales of the brown coal formation, for which iron was formerly employed. The burned pyrites of Schœlmer are regularly employed, mixed with other ores, for making iron.

In regard to its use for road-making, for which it is well fitted by its solidity, dryness, and uniformity, Sarrazin gives the following warning. If the pyrites contain any zinc, sulphate of iron and sulphate of zinc are formed, by oxidation, and after a long time spread to the land adjoining and destroy the vegetation, rendering the land useless.

Girardin, Aimé, Morin, and Henri have described in *Ann. Chem. Phys.* the four largest deposits of pyrites, and analyzed 28 of those used in France for making sulphuric acid. The percentage of sulphur in these varies from 30 per cent to 53 per cent., with an average of 45½ per cent. In 5 they report traces of arsenic; in 5 others a slight trace, while in the others the arsenic was reported at from 0·01 to 0·23 per cent. In 1874, as much as 174,400 tons, worth $1,200,000, were consumed in France; of which the mines at Sain-Bel, Department of the Rhône, furnishes 121,000 tons. Belgium, Norway, and Spain furnished 18,000 tons. The consumption of acid has increased two-fold in France and three-fold in England within ten years, much of the increase being due to its use in the manufacture of fertilizers. A knowledge of the foreign constituents of the ores, especially arsenic and gangue, is very important to the manufacturer. The arsenic passes into the numerous products which are made by the use of sulphuric acid from pyrites; carbonate of lime is decomposed in roasting the pyrites, and is detrimental, first by producing carbonic acid, which renders the gases impure, and secondly by forming sulphate of lime, which involves a loss of sulphurous acid and makes the use of the burned pyrites in metallurgy difficult. Fluoride of calcium (fluorspar) produces hydrofluoric acid, which produces injury in the leaden chambers, by attacking glass vessels used to hold nitric acid, so that the latter comes into contact with the lead and destroys it.

The sulphuretted hydrogen gas produced in the manufacture of sulphate of ammonia is utilized in Kunheim's works in Berlin in this way, that the gas is conducted into the pyrites furnace, where it comes into contact with the glowing pyrites and is completely burned. In this way they not only recover the sulphur that would otherwise be lost, but also avoid injury to their neighbors from the odor of escaping sulphuretted hydrogen. The nitric compounds contained in aniline residues are utilized at the Schœnebeck works by passing these acids through a Glover tower.

A Curious Underground Railway Accident.

In the open country, where unfenced road crossings are frequent, it is easy for cattle to stray upon the track, and it is not surprising that accidents from such causes should take place. But that a disaster should occur upon an underground railway in the heart of a great city, seems almost incredible. Such, however, was the actual fact, recently, in this city, the scene of the accident being within the central tunnel of the Harlem Underground Railway, Fourth avenue, near 57th street. The New York and Boston express train was at that point approaching the station at 42d street, half a mile distant, when the engineer discovered four wild bulls upon the track. The locomotive struck the animals and was thrown from the track. The passengers were greatly terrified and jarred, but no person was injured. All the animals were killed. It appears that they belonged to a herd of wild Texan cattle which was being driven across the city; and on passing the level ground near the Grand Central Depot, in front of the tunnel railway entrances, these four animals suddenly wheeled and dashed off into the middle tunnel on a full gallop and encountered the locomotive as stated. It is evident that the entrances to the underground railway need to be better guarded. Perhaps some ingenious person can devise a system of gates to be operated by the cars.

Artificial Lemonade.

Loaf sugar 2 lbs., tartaric acid ½ oz., essence of lemon 30 drops, essence of almonds 20 drops. Dissolve the tartaric acid in two pints of hot water, add the sugar, and lastly the lemon and almond; stir well, cover with a cloth, and leave until cold; put two tablespoonfuls into a tumbler, and fill up with cold water. This drink, it is said, will be found much more refreshing and more palatable than either ginger beer or lemonade, and costs only 30 cents for ten pints. The addition of a very little bicarbonate of potash to each tumblerful just before drinking will give a wholesome effervescing drink.