covered with canvas laid crosswise and overlapping about 2 in. These tables have a grade of 1½ in. to the foot, are 13 ft. long and 12 ft. wide. After receiving the flow for an hour, it is shut off from the table and a flow of clear water turned on, which in a few minutes washes away the sand, when it is also stopped; then with a hose ending in a flat nozzle, the accumulated sulphurets are washed from the canvas into a trough below, extending along the base of the entire series. In order to secure sufficient fall for this sluice, each succeeding table is set 4 in. lower than its predecessor, giving 40 in. fall on 125 ft. of sluice length. Two extra tables are arranged, one at the end of each row, to take up the surplus flow during the time one of the tables is shut off, to avoid overloading, as each table already carries the proper amount of pulp. The effectiveness of the canvas-tables depends on maintaining an even flow of pulp during a given time; it will not do to overload them. All the pulp that leaves the table is considered waste, and is collected in a flume, to be used a short distance off as power on an overshot wheel, by means of which the patentee runs a vanner of his own invention. This waste water is caught up again and used on a second wheel, which also runs a vanner. The sulphurets washed from the tables flow through a sluice to a box outside the building, 12 ft. long 2 ft. wide, and 12 in. deep, with a cross-piece 2 ft. from its upper end, reaching within 2 in. of the top of the box; in this upper section the coarser grade of the material is retained, while the finer flows over the weir. The two grades are shoveled out separately and placed in separate V-shaped boxes, over which are perforated iron pipes, from which small streams of water trickle, gradually carrying the pulp down and passing it through sluices onto the spreaders of separate vanners. These two machines work with different motions, doing excellent work on this impalpably fine stuff. The slimes flowing from the washing-boxes beneath these vanners are conducted, with the overflow of the two compartment boxes above referred to, to two other canvas-tables, below which they are allowed to escape as waste: not that they have given up all the precious metal they carried, but because the point is reached where it is more economical to lose the remnant than to attempt to save it.

As the slimes from most of the canvas plants, as usually operated (especially where the ore crushed carries a heavy percentage of sulphurets, or has been stamped with a high discharge), are still valuable in gold, tkey can be conveyed to so-called slime-settlers, or tanks. These tanks, for there are generally several, are placed below the canvas platforms, and are about 2 ft. deep, 2 ft. wide, and 12 to 20 ft. long; they are divided into sections of 2 ft. square, by 2 in. plank set on edge, extending alternately from each side, leaving an opening 4 in. wide and 2 ft. deep, causing the slime water to take a serpentine course in passing through. The tanks stand level, and the slimes, in settling, form their own grade as they enter at one end of the tank, and passing through the successive sections, issue at a diagonally opposite point only slightly clouded. These tanks require cleaning only at long intervals.

Up to the present time, the concentrates in the California mills have been generally handled by the chlorination process, to free them from their gold, but within the last year several plants are successfully working them by the cyanide process.

The tendency in the construction of mills at the present day is to a substitution of steel for iron, where possible, and to an increase in the weight of the stamps.

A greater application of grinding and amalgamating machines, in place of or subsidiary to the stamp-mill, is also noticeable, the most popular of which will be shortly described.

For a more thorough appreciation and knowledge of the work done by mills, records should be kept, by the amalgamator, of all transactions connected with mill work, showing every item, loss of time, consumption of mercury, iron, fuel, water, amount of rock treated, etc., in addition to the records kept in the assay office. This is already being done to some extent, but such records should be kept in the small mills as thoroughly as in the large ones.

(To be continued.)

The Treatment of Timber for Use in Mines.

By Robert Martin.*

The treatment of pit wood to render it durable and incombustible, though apparently a small matter, is of great importance for the safer working of mines, and deserving of the attention of mining engineers.

Falls of roofs and sides are, as is well known, one of the most prolific sources of accidents in mines, and probably no one will be disposed to deny that many of these are due to decay or dry rot in the timbering. But in addition to loss of life and injury to person there is considerable expense at every colliery due to falls, such as stoppage of plant, clearing the rubbish from the roadways, and the replacing of timberr Systematic propping is good, and to be insisted upon, but the propping and securing of all main passages with timber as free as possible from decay is surely better.

Circular shafts lend themselves to lining with brick and cement, which are of such an enduring nature that anything else is scarcely ever thought of. Rectangular shafts, so common in Scotland, are almost universally lined with timber. It is very evident that this wooden lining should be so treated as to preserve it from decay or fire as long as the colliery is likely to be in use; the more so if the sides of the shaft are of soft materials. Those in charge of old shafts filled with winding cages, pumps constantly in motion, haulage ropes, pipes, etc., know the difficulty of carrying out thoroughly the repairs which may be absolutely necessary. The danger to all concerned from decayed timber in a shaft may be very great.

The writer knows a colliery, the pits of which were sunk through 60 ft. of sand, containing very little water. The barring was 6 in. thick of good pitch-pine, and was water-tight. The colliery had been in existence for about sixteen years. A portion of the area of one of the two pits was spaced off and used as the upcast shaft for both. The ventilation was produced by three furnaces and the furnace of a steam boiler, all situated near the shaft in the various coal seams being worked. After a long spell of wet weather, one forenoon without the least warning, at a depth of about 30 ft. from the surface, the barring of the up-cast shaft suddenly gave way through decay; a large quantity of sand and water rushed into the pit, and falling down the shaft reversed the air current. Fortunately the miners were idle on the day of the collapse, and the furnaces were burning low, or the consequences might have been much more serious.

Underground fires in mines and fires on the surface at the pit-mouth are of frequent occurrence. These are sudden, destructive, and frequently fatal. This is largely due to the use of ordinary timber in the engine-, pump- and lamp-rooms underground, and in the erections which are situated near the pit-mouth on the surface. This timber is often so dry and sometimes so saturated with oil and grease, especially the floors, as to be readily inflammable; and an overturned lamp, a lighted match thrown carelessly down, or a spark from a passing locomotive may give rise in a few seconds to an uncontrollable mass of smoke and flame. It is not uncommon to see, in the midst of a lofty and extensive series of wooden erections at a pit-mouth, an open fire-lamp or brazier burning, the ashes and cinders from which fall on an iron plate resting close on the planks of the staging. It would seem to be the correct thing wherever machinery is placed, or stationary lights of any sort are fixed underground, and in surface erections at the pit-mouth, that only iron, stone, concrete, or timber rendered practically incombustible should be allowed.

A method of treatment of timber known as the Henry Aitken method is in use at Niddrie collieries. In this process the idea is to soak the timber in hot or boiling water containing a strong solution of common salt and chloride of magnesium. The timber treated should be free of bark, well seasoned and thoroughly dry. For this purpose it is kept under cover for a time. The props that have been found most suitable are those free of bark and natural sap. These are mostly shipped from Sweden, and from several ports in Norway. The ordinary good class of battens and deals from Sweden can also be treated to great advantage.

The plant at Niddrie collieries consists of two malleable iron rectangular boilers made of ½ in. plate, each 19 ft. long, 4 ft. wide and 3 ft. deep, built into a brick seating, with a furnace under each, a flue along the bottom and sides, and a chimney. There being no waste steam, the boilers are fired with dross coal, and kept as nearly at the boiling point as possible. The tanks are covered with loose boards. The proportion of common salt to chloride of magnesium should be as 7 to 1, and there must always be unmelted salt at the tank-bottom. One tank is emptied and filled daily with props, crowns, sleepers, wooden bricks, wedges, ladders and bratticing. This gives nearly two days' boiling for each tank. The props, being mostly 6 in. in diameter, require boiling for this length of time, in order that they may be thoroughly penetrated by the salts. One days' boiling is quite sufficient for 4 in. prop-wood. Pitch-pine and larch require longer boiling than the softer woods. Each tank holds about 50 cwts. of all kinds of timber. About 15 tons of treated timber can be produced per week at a cost of:

	£	s.	d.
Dross, 2 tons, at 3s. per ton	0	6	0
Salt, 18 cwts., at 21s. 6d. per ton	0	19	7
Chloride of magnesium, 2½ cwts., at 3s. 7½d. per cwt.	0	9	1
Wages of one man attending	0	18	0
Total	£2	12	8

or, say, 3s. 6d. per ton. This adds about 1s. 5d. per 100 ft. to the cost of 6 in. prop-wood. The royalty charges have to be added to this cost. When the timber is removed from the boiler it is soft, and not in a condition for immediate use. It is dried by being put into a covered shed or stacked in the open air. A few days' exposure brings it back to nearly its original strength. When stacked on end, the props dry more rapidly than when placed horizontally.

The average life of ordinary prop-timber at Niddrie collieries is about ten months, thus involving frequent and costly renewals in brake-inclines, return-airways, and horse-roads. In some parts, where the decay is very rapid, timber treated as above described has stood since the latter end of 1893, and it is still as fresh as when put in.

The temperature of the air varies from 68 degrees to 80 degrees Fahr., in some parts dry, in others moist. It is found that hutch-sleepers of home-grown fir, spruce, and, in fact, every kind of wood subject to decay, used in a pit, is made much more durable by this treatment. In the mine passages, salted timber is easily distinguished from other timber by its damp appearance.

No experience has been gained at Niddrie as to the behaviour of salted wood in case of fire; happily there has been no occasion. As a precaution against fire, if salted wood were used for lining or flooring engine-rooms or pit-head erections, being always damp, it would not catch fire so readily or burn so fiercely as ordinary timber does.

The cost of the plant is about £100.

Mr. Fisher (Newton) asked whether the incidental charges over and above the mechanical process were included in the cost given?

Mr. Martin said that the man was not fully employed, but his whole wages were included in the cost.

Mr. J. B. Atkinson asked whether Mr. Martin could give them an idea as to the non-inflammability of the salted timber.

Mr. Martin said that the only thing he could refer to was the case of a miner who hung to a treated post his coat and vest, containing his tobacco pipe; they took fire, and the whole were burned to ashes, scarcely making any impression on the treated prop on which they were hung.

Mr. Donald (Cambuslang) said that it seemed somewhat surprising that one man was able to handle all the timber necessary in connection with a large colliery, and dry it thoroughly at so low a cost.

Mr. Martin said that the quantity of timber handled was 15 tons, being that used in the horse-roads and return air-ways.

Mr. Forgie said that the special object was to make mine timber non-inflammable. Hitherto it had always been found that such attempts caused it to become brittle, and it did not stand the weight so well as before, while, as regarded pit-sleepers, the nails would not hold. At Messrs. Baird's collieries, ten years ago, they commenced to creosote the timber for underground purposes; and as regarded two pieces of timber in the return air-course, one of which was so treated and the other not, he saw the former a fortnight ago and it was as perfect as when put in ten years ago. The process had been discontinued, because there was a certain amount of danger connected with it. No doubt the timber was made more liable to take fire than in its natural condition. Then, when used as crowns, it was found to get quite brittle. He asked Mr. Martin if his process had the same effect on the timber, and how he dipped it?

Mr. Martin said that one man did not seem to have any difficulty in filling the tank. They had no complaints from the miners as regarded the timber, and did not observe that it was any more easily broken than other timber. They tested a batten 7 ft. long, 9 in. by 3 in., for its breaking strain, and found that 45 cwts. broke it. They tried a salted one and it broke at 42 cwts. This difference might have been due to the timber itself.

Mr. Watson (Cadzow colliery, Hamilton) said that with hutch-sleepers treated by this process they found the nails corroded easily, but since using galvanized nails there had been no complaints.

Mr. Menzies (Blantyre) said that some two years ago they tried this system, but unfortunately he was not in a position to say much about it, for they had had to renew the timber before it was done. They gave up treating the sleepers because they would not hold the nails. He must say that in the preparation of the wood he could not do so much work as Mr. Martin stated with one man. It took two men, and they were not dipping a quarter of the wood that they were using. He admitted that it was a good idea, but unfortunately it did not suit Auchinraith colliery, for there the wood was broken in a few months. At the same time there was a piece of timber which had been standing in their return air-course for seven years.

* A paper read before the Mining Institute of Scotland.