

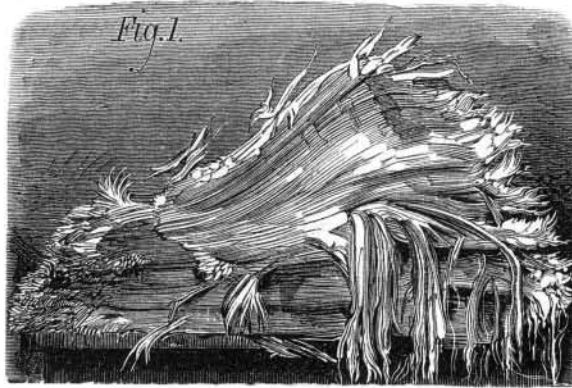
THE INDUSTRIAL USES OF ASBESTOS.

Asbestos is a mineral fiber, composed of silicate of magnesia, silicate of lime and protoxide of iron, and manganese. Mineralogically the name is given to the fibrous varieties of tremolite, actinolite, and other varieties of hornblende, excepting such as contain alumina, and also to the corresponding mineral pyroxene. It exists in vast quantities in the United States, in various parts of Great Britain, Hungary, Italy, Corsica, and the Tyrol. To various kinds of asbestos have been applied the names "mountain leather," "mountain cork," "amianthus," and "chrysotile;" and certain other minerals having characteristics resembling those of asbestos are described as asbestoid, asbestiform, and as lamellar-fibrous. Without entering into any description of these species (for we have to deal only with asbestos proper, in considering its industrial applications), we may at once note the chief characteristics upon which the value of the mineral depends. And these are, first, its indestructibility by fire and its insolubility (except for a few varieties) in acids; secondly, its peculiar fibrous quality.

The material is obtained from the mines in forms ranging from bundles of soft silky fibers to hard blocks. The blocks may be broken up and separated into fibers, which, like those naturally obtained in that state, are extremely flexible, admit of great extension in the direction of their length without cracking, are greasy to the touch, and very strong. The fiber obtained in New York and Vermont varies in length from two to forty inches, and resembles unbleached flax when found near the surface; but when taken at a greater depth, it is pure white. Upon the length, flexibility, and strength of the fiber, the value of the asbestos depends. The engraving, Fig. 1, is drawn from an exceptionally fine piece, and exhibits the fibrous structure very perfectly. The fragment is 43½ inches long, 7½ inches thick, and 21 inches wide, and weighs 114 lbs.

It is a curious circumstance that, although the valuable qualities of asbestos have been known since time immemorial, it is only during very recent years that the mineral has been extensively used. Its employment among the ancients was confined to the manufacture of an incombustible cloth in which the bodies of the dead were cremated, and of napkins which were cleansed by throwing them in the fire. We find record of its employment as lampwick and for fireproof

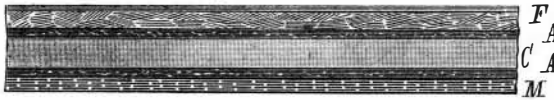
containing asbestos, but through its composition independent of that material. From Fig. 2, which is a section of the asbestos roofing, its construction will be understood. F is a layer of asbestos-coated felt; A A are layers of acid and



A FINE PIECE OF ASBESTOS.

waterproof composition into which asbestos enters. C is a canvas, and M a manilla lining. These materials are compressed to a sheet resembling leather, about one tenth inch in thickness, and produced in continuous rolls about 40 inch-

Fig. 2.



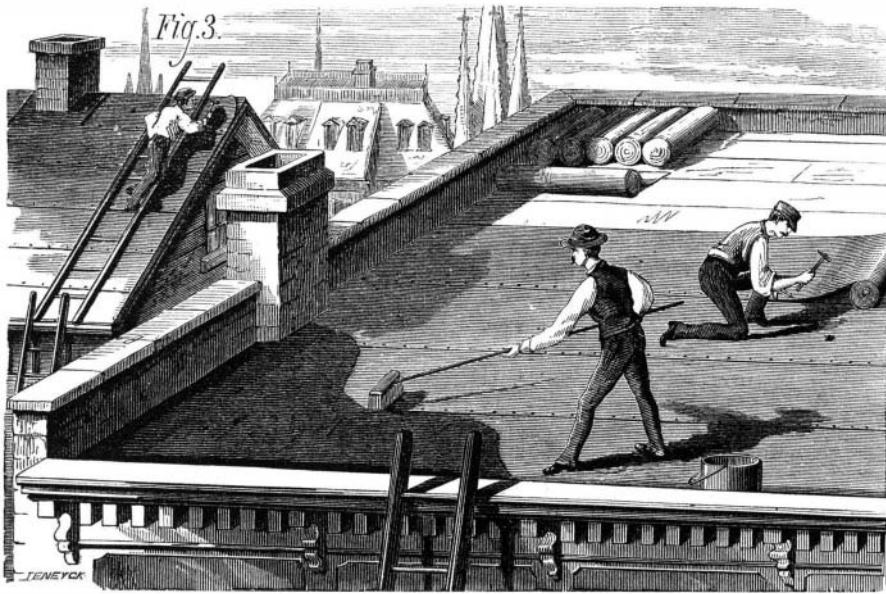
ASBESTOS ROOFING—SECTION.

es wide, each roll containing 200 square feet. The weight is 50 lbs. per 100 square feet, or about one tenth that of gravel roofing. The manner of applying the rolls to the roof is shown in Fig. 3, the operation consisting in merely tacking the fabric to the boards. This is done with equal facility on either flat or steep roofs. The last process is to go over the laid roofing with a prepared coating of suitable color. This is made of asbestos in a flocculent state, mingled with silica paint body and other ingredients. It is applied with a brush,

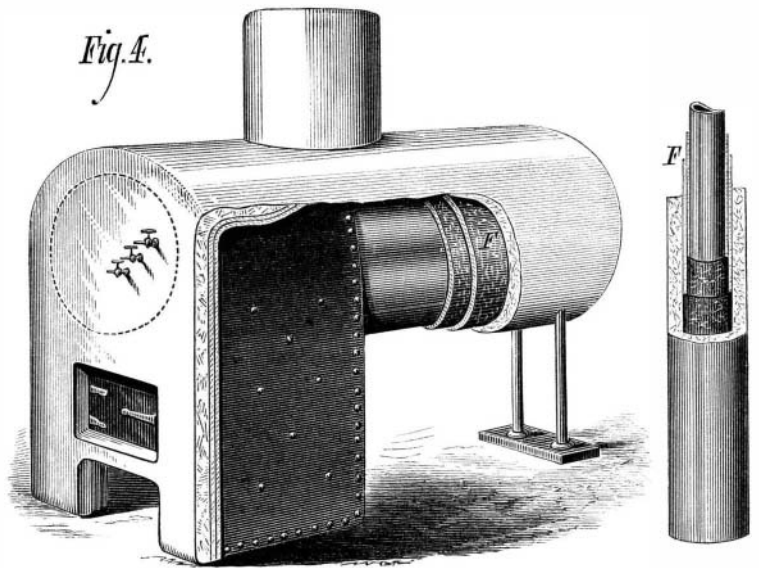
plying the insulating material will readily be understood from Fig. 4, which shows both a boiler and a portion of a steam pipe, covered, F being the felting. We are informed that the materials are very easily and cheaply applied, that the pipes so covered are smaller and neater than is usually the case, and that there is no danger of the envelope cracking through the expansion of the pipes. These feltings were subjected to severe tests, at the New York navy yard in 1874, which they successfully withstood, showing the highest degree of efficiency as non-conductors of heat.

Asbestos steam packing offers in itself utilizations as important in some respects as any other here mentioned. Ordinary packing in engines is obliged to contend with an elevated temperature, moisture, and friction, all agents tending towards its destruction. From the testimony of those who have used asbestos prepared as below described, it appears wholly indifferent at all times to temperature and moisture, while its self-lubricating qualities protect it greatly against wear due to friction. The mode in which the packing is made is shown in Fig. 5. The long flexible fibers of the asbestos are securely covered by a thin braid, forming ropes from three eighths to two inches in diameter, which are put up in coils of 50 lbs. each. It is especially suited for use in cases where the effect of high pressure steam is to be met. We are informed that it has been employed without removal on an ocean steamer which sailed over 90,000 miles, and in another case on a locomotive which ran over 50,000 miles, in both instances showing but slight effects of wear, and necessitating no stoppages.

As a paint body, some varieties of asbestos, through its capability of being reduced into almost impalpable powder, has been found excellently adapted. It is exceedingly tenacious, and so renders the pigments not liable to chalk, crack, or scale, while it possesses superior covering qualities. Less coloring matter is required in the manufacture of these paints than in any other, and they are prepared and sold by Mr. Johns ready for immediate application by the brush. The ingredients are simply the best linseed oil and colors, with the asbestos body; and the paints are not offered as strictly fireproof, although it is believed that they will resist fire after drying, much better than ordinary paint. They are made in all shades, and are especially well suited for outside work, such as railroad cars and bridges, walls, fences, etc.



LAYING DOWN ASBESTOS ROOFING.



ASBESTOS-COVERED BOILER AND PIPE.

gloves and clothes for metal workers and firemen. Not very long ago, we learnt of its entering into a peculiar quality of wall paper made in Rome, Italy. With these few exceptions—and in no case has any of them risen to the level of even a minor industry—asbestos has occupied the position of a mineralogical curiosity, a product reasonably certain some day to find its place in human economy, but nevertheless one which inventors seemed systematically to overlook.

It is to Mr. H. W. Johns, of New York city, that the credit of first using asbestos for industrial purposes on a large scale is due. Some years ago, that gentleman invented a cement in which one of the ingredients was asbestos. Asbestos, however, despite its abundance, was then exceedingly difficult to obtain. It could be purchased only in small quantity at a high price, and certainly offered no very promising prospects of an adequate supply, should a large demand for the cement be realized. Nothing daunted by this scarcity, the inventor advertised his cement widely, through the SCIENTIFIC AMERICAN and other journals; and the result of his advertisements (as with considerable shrewdness he had anticipated) was not merely an augmented sale of his invention but an avalanche of letters from all quarters of the globe, in which the writers mentioned deposits of asbestos in their vicinity, and offered supplies. Thus, ere very long, Mr. Johns became possessed of abundant facilities for obtaining any quantity of the mineral, and was free to proceed with the experimenting which led to the other and more important utilizations which we are about to describe.

In a little volume which has been compiled from Patent Office records, we find over three hundred patents for roofing compositions, and probably this number is much below the total of this class of inventions. In all these compounds, there is a general sameness, due perhaps to the presence of gas tar and various conglomerations of gravel, resin, paper, felt, cement, and chemicals in the large majority. From all these, the asbestos roofing differs: not merely through its

and forms an elastic waterproof felting. For large and important city edifices, an asbestos concrete may be applied by means of a trowel and in lieu of the above coating. The advantages claimed for the roofing are that it forms a water and airtight smooth surface, which is a good non-conductor of heat, and is practically a resistant of fire: also that it is adapted to all climates, and is unexcelled in durability and cheapness by tin, slate, or shingles, of the qualities ordinarily used.

The second application of asbestos to which attention may be directed is as a covering for steam boilers and pipes. For this purpose it is prepared in various ways. A cement felting, composed of asbestos and a cementing compound, may

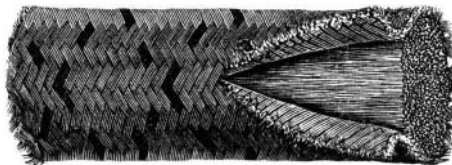


Fig. 5.—ASBESTOS PACKING.

be used like mortar and applied directly to the pipes, forming an excellent fireproof non-conductor of heat. It is improved, however, as a covering by the addition of an asbestos lining felt, which is a strong sheathing, to one side of which is attached a layer of flocked asbestos. This is applied, say in two turns, directly around the pipe, and the cement laid on outside. Each layer of asbestos thus forms a sort of air chamber, which adds greatly to the insulating capabilities of the cover. At the same time the felt admits of the expansion of the pipe and also serves to protect hair felts, when the same are placed over it, from charring and other injurious effects of heat. An asbestos-lined hair felt is likewise manufactured, which is especially suitable for covering marine and locomotive boilers. The mode of ap-

Lack of space prevents our describing, in detail similar to the above, the many other productions into which asbestos enters. Of the more important of these we may mention asbestos cements (fire, acid, and water proof) for linings and fillings for iron columns, floors, and for slate and other roofs, for cementing steam and other joints, fire clay retorts, etc., A fireproof coating is also made for wooden structures and shingle roofs, and for surfaces, not exposed to the weather, which are liable to ignition. This is applied with a brush, and may be subsequently coated with asbestos paint. Asbestos board is made from pure asbestos in flexible sheets of various sizes and thicknesses, forming a valuable covering for locomotive boilers, and for flat packing, gaskets, etc., and as a protection for all surfaces exposed to fire. Asbestos paper is used for lining cloth, fire screens, etc., and for filtering acids. Asbestos thread may be woven into fabrics, and an asbestos lubricator is manufactured, designed for heavy machinery, wagon axles, etc.

All these varied applications are the result of continued experimenting and investigation on the part of the inventor, a labor which has lasted since 1867, and which is still in progress. That they are of a high degree of value and utility may perhaps best be judged by the rapid increase which has been felt in the demand for asbestos products, and by the excellent results which actual employment has demonstrated them capable of yielding. Any further information will be cheerfully given by the patentee and manufacturer, Mr. H. W. Johns, 87 Maiden lane, New York city.

CLIPPING HORSES.—M. Veterinary Surgeon Félizet recommends that, instead of clipping working horses in autumn, a good shining coat, free from skin dust, can be secured by giving the horses, from the middle of September, either alone or mixed with their evening feed of oats, one tenth of a quart of bruised hemp seed, and the same quantity of buckwheat in its natural state.