ever, although he cannot swell the fibers of the hide with tannin to the extent above noted, must produce a firm, solid article, with not a little of the elasticity and strength of steel; it must be sufficiently flexible, and yet of great power to resist wear by attrition, and to stand, with little stretching, the heaviest direct strain. These qualities are best obtained by an amount of tanning which will make the finished leather but little thicker than the raw hide of which it is made. On cutting a piece of sole or belting leather, one will notice the network of hide fibers interlacing each other, and which, before tanning, were surrounded with gelatine. These fibers give the hide its great tensile strength, and any considerable displacement of them by the transformation of the hide into leather impairs this quality. A piece of good belt leather, therefore, when freshly cut, should look bright, with the intervening spaces between the fibers fine, even, and regular. The texture should be uniform throughout, and with the utmost solidity there should be great elasticity.

No rule can be given by which the exact amount of tanning to make the best belt leather can be determined, but it is certain that to make heavy belts only the largest and heaviest hides should be used. The amount of tanning different kinds of leather receive varies widely, but there is a sort of regular gradation whereby, leaving out altogether the proportionate weight of the raw hide, sole leather receives the most tannin, with belt leather, harness, heavy upper, calf skins, and morocco following next in order, until we reach kid stock, which is generally finished with alum, and known as a tawed rather than a tanned product.

In judging as to the kind of tanning material which makes the best belt leather, there is very general unanimity in favor of oak bark. Hemlock bark is used to some extent in making belt leather of the cheaper grades, but various devices are resorted to with the design of giving the leather the appearance of oak, and thus deceiving the purchaser. The difference can, in nearly all cases, be readily detected by comparing the hemlock with the oak leather, and it is pretty well known, by all who care to be informed in the matter, just what tannages of leather the different belt makers use. In England various "mixed" tannages of leather are employed, *i. e.*, the leather is made with valonia, divi-divi, myrabolams, and gambier, instead of bark, for the tanning material; but these all make an inferior grade of leather, both for belts and for the soles of boots and shoes.

THE YEAR' PRODUCT OF GOLD AND SILVER.

The annual report of the Director of the U. S. Mint states that the production of the precious metals in the United States in 1879 was considerably less than that of the preceding year. It has resulted from the diminished yield of the mines of the Comstock lode. A depth has been reached of 1,000 feet below the bed of the Carson River, and impediments are encountered from accumulations of water and from the oppressive temperature, which discourage and have retarded vertical explorations. This has caused a falling off in the total yield of the States as officially reported, which in 1878 was $47,076,863 of both gold and silver, but which for 1879, J. F. Hollock, the State Comptroller, reports to be only $19,305,473.97 from the production of the preceding year. Although the production of Nevada will be large and continuous for many years, it does not appear probable that the mines of that State will make such enormous contributions to the mineral wealth of the country as they have in previous years. This decrease has been in part compensated by the results of the more thorough exploration of the mining regions of the Rocky Mountains, especially in Central and Southern Colorado. The production of that State was at least $6,000,000 greater in the last than in the preceding year, and will probably furnish an undiminished if not an increasing amount of silver in the future. After careful inquiry and consideration of the yield of different localities and mines in the United States, the Director estimates the total production of the precious metals in the country for the fiscal year 1879 at $79,712,000, of which $38,900,000 was gold, and $40,812,000 silver, as nearly as can be ascertained from official and other trustworthy sources.

Nearly all the gold and a large portion of the silver produced in the United States during the last year was coined at the mints or used in domestic manufactures, arts, and ornamentation. The surplus was exported to non-producing countries. From all information it is safely assumed that the annual consumption in the United States of precious metals in all forms for manufacturing purposes now averages $7,000,000 of gold and $5,000,000 of silver.

STEAM PILOTAGE.

The first effect of every new improvement in industrial means and methods is to hurt somebody. The greater the improvement the greater the hurt; and naturally also the more vigorous the protest against the change by those whose professional or financial interests are bound up with and dependent upon the old.

This universal law is aptly illustrated in the war over the new steam pilot boat lately introduced in the harbor of New York. Hitherto our pilot fleet has consisted of sailing craft only. They have been splendid boats of their kind, and admirably handled. The capital invested in them has been something like $200,000; and 117 of the 133 pilots having an interest therein protest that the introduction of steam pilot boats would tend to destroy this investment and seriously injure the service. The existing system undoubtedly possesses many admirable features; the pilots are exceptionally brave and capable navigators, who take an honest and honorable pride in their work; but there can be no question of the fact that their exclusive devotion to sails is a mistake. The adoption of steam pilot boats for inshore service cannot fail to prove advantageous to our shipping, now frequently delayed by calms, darkness, adverse winds, or ice, against which sails are unable to contend successfully. In such cases, steam pilot boats must be much more promptly serviceable; and the sailing pilots admit the fact when they protest so vigorously that steam will destroy the value of their sails. That is their misfortune; a misfortune which befalls sooner or later every vested interest in these times of progress. With all respect to the pilots who have had a practical monopoly of the trade so long, their interests are in no way commensurate with those of the shippers and ship masters of New York; and if the commerce of our city is to be benefited by the change from sails to steam the change will be made. The good of the many overrides the interest of the few, however meritorious may have been the service displaced thereby.

CHICLE.

The great interest manifested by technical men in the search for substitutes for India rubber and guttapercha has led Drs. George A. Prochozka and H. Endemann to make an examination of the Mexican product known as chicle or sapota. The latter name seems to imply that the product is derived from one of the many species of sapotaceæ, one of which is pointed out as the tree furnishing balata. With the latter product chicle shares many qualities, and possibly may differ from it only in consequence of the mode of collecting. Chicle comes from Mexico; balata from British Guiana, being the concrete juice of a tree variously called *Mimusops balata, Achras balata, Achras dissecta,* and *Sapota muelleri.* While balata is an almost pure hydrocarbon, with its various products of oxidation, Chicle contains also the various impurities of the juice from which it is derived.

The results of the examination of chicle by Drs. Prochozka and Endemann are given in the first volume of the Journal of the American Chemical Society. The material came in cakes of a chocolate or flesh color, especially on the surface. It crumbled between the fingers, yet had a certain degree of softness and tenacity, which was increased by heating. In the mouth it first crumbled, then united into a soft plastic mass—a quality which has made it a favorite material for chewing gum. On heating, a sweet caramel odor was evolved, then the peculiar smell which is generated when caoutchouc or guttapercha is heated. It disintegrates when boiled with dilute acids, the brown solution containing oxalic acid and saccharine matter. The residue boiled with dilute solutions of caustic alkalies unites again, and forms a doughy mass. Approximately its constituents were:

Chicle resin or gum, forming 75 per cent of the crude material; oxalate of lime (with small quantities of sulphate and phosphate), 9 per cent; arabin, about 10 per cent; sugar, about 5 per cent; salts, soluble in water (chloride and sulphate of magnesia, small quantity of potash salts), 0·5 per cent.

From this composition the authors hold it evident that chicle is the product of direct evaporation of the juice, without any attempt at separation, as is practiced in the case of guttapercha and India rubber; and they do not doubt that by proper treatment of the juice a product far more valuable than the chicle gum now sold would be obtained. Whether such product would be similar to guttapercha, balata, or India rubber, they are unable to say. That must be determined by an examination of the raw juice, which they had not been able to obtain.

INVENTIONS WANTED TO UTILIZE SAWDUST.

The mill owners of Minneapolis are greatly perplexed by the volume of sawdust they produce, and not a little alarmed at a threatened law forbidding the present disposition of such waste by dumping it into the river. It is calculated that the sawdust from the summer cut of logs converted into boards at that place amounts to something like 300,000 cords—enough to furnish constant work for 150 teams to cart away. The millers say they cannot afford so heavy a burden of expense, and the river communities can as ill afford to have the river spoiled by the rapidly accumulating refuse. Even the steam mills are unable to burn all their waste, and the owners of them would no doubt gladly unite with their water using neighbors in turning over the surplus sawdust gratis to whoever would agree to cart it away. Three hundred thousand cords a year of good fuel is certainly worth an effort to save, and this is the product of but one locality.

Who will invent an economical mode of making sawdust marketable? And who will devise new applications for such materials? Most likely there are hundreds of easy ways in which such materials, now a burden, could be turned to profit if our inventors would only take the trouble to think of them and work up their practical applications. Such simple devices for utilizing waste products are often the sources of large profits.

THE NEW ATLANTIC CABLE.

The laying of the sixth telegraphic cable connecting the United States with Europe, was completed November 17. It extends from Brest, France, to St. Pierre, off Newfoundland, thence to North Eastham, near Provincetown, Cape Cod, Massachusetts, where connection is made with the land lines of the American Union Telegraph Company.

The cable was constructed by Messrs. Siemens Brothers, of England, and is considerably stronger than any of the cables previously laid. The central wire of copper is surrounded by ten copper wires, twisted, insuring absolute conductivity in all weather. For insulating purposes three envelopes of gutta percha surround the wire, and outside of the gutta percha is placed a wrapping of manila hemp treated with Chatterton's compound. An armor of steel wire for protection is outside the hemp, the wires composing the armor being laid in a peculiar manner, side by side, so that fractures seem almost impossible to occur. Surrounding the armor is another covering of manila hemp saturated with an anti-corrosive compound. Not only is the insulation of this cable regarded as superior to all others, but the celerity with which it was constructed and laid is without parallel in cable history. The work was completed in exactly seven months from the day the concession to the company was granted by the French Government.

The Proposed World's Fair.

At a recent meeting of the World's Fair Committee in this city, the secretary reported that since the last meeting of the committee an extensive correspondence had been conducted with the parties who were exhibitors at the Centennial Exhibition, with a view to ascertaining, as far as possible, how they had estimated the results of that display upon their business. He said he had received a large number of replies very strongly indorsing the project of holding a similar fair in this city in 1883, and asserting that the results of the last one as manifested in their business had been eminently satisfactory. Many express themselves desirous of preparing exhibits for the projected New York fair. Various large concerns interested in the cotton industries, others in the different lines of manufacturing hardware, the iron and coal trades—all are willing to encourage the undertaking. The committee has corresponded with several eminent gentlemen in England, Spain, France, Italy, and elsewhere. These parties are willing to co-operate with the projectors of the enterprise. Among them are Señor Jordana, who was Commissioner from Spain at the Centennial Exhibition; Signor Dassi, Italian Commissioner to Philadelphia in 1876, and others.

The Chairman of the Committee on Sites reported that twelve sites had been offered, but only three were recommended from which a final selection could be made. These were Manhattan Square and adjoining property, on Eighth avenue, between Seventy-second and Ninety-second streets; the Washington Heights site, and that known on the list as the East Side Sands, of Brooklyn.

The Committee on National Legislation reported that they were prepared to present to Congress the bill which has heretofore been reported to the General Committee. A motion offered by Mr. Louis May, that a mass meeting, under the auspices of the General Committee, be held in the Cooper Institute, in December, for the purpose of giving an impetus to the World's Fair movement, was adopted.

The Audiphone.

Enough was accomplished at the public exhibition of the audiphone in this city, November 21, to show that we have in it an extremely promising aid to those afflicted with defective hearing. It is quite possible, too, that it is the leader in a line of invention which will ultimately enable the mute to speak as well as the deaf to hear.

The instrument is simply a thin plate of vulcanized rubber shaped like a Japanese fan. When in use it is curved to give it the requisite tension, by means of cords attached to the outer edge of the fan and fastened at the junction of the handle. When the top of the fan is placed against the upper teeth the impinging sound waves create a sensible vibration which is conveyed through the teeth and the bones of the face (or possibly by the dental nerves) to the auditory nerve. With a little practice the sounds thus received are interpreted the same as if they reached the nerves of hearing through the ear; and thus the deaf are made to hear more or less distinctly, provided, of course, that the auditory nerve itself is not defective. Experiments are being made with a class of deaf-mutes to determine whether such unfortunates can be taught to speak by the use of this invention, a result strongly indicated by the results thus far obtained. In any case the audiphone seems to mark a decided advance upon the old-fashioned ear-trumpet.

A Singular Accident.

Recently the SCIENTIFIC AMERICAN lost a subscriber by an accident which should furnish a lesson of carefulness to railway hands. As two trains were approaching each other on the Central Railroad of New Jersey—one an express train running at the rate of sixty miles an hour, the other a coal train—the fireman of the latter threw out a piece of slate. The stone struck some part of the express engine, and, glancing, passed through the window of the cab, giving a death-blow to the fireman of the express train.

A Fact for Advertisers.

There were printed and circulated by mail and through news agencies, of last week's issue (No. 23) of the regular edition of the SCIENTIFIC AMERICAN, more than 75,000 copies, besides the usual large edition of the SUPPLEMENT. Advertisers will bear in mind that the publishers guarantee that every week's issue shall not be less than 50,000 copies, and that it frequently exceeds that large number by several thousands, as it did last week.