

PORTLAND, OREGON, SUNDAY MORNING, NOVEMBER 18, 1906

How ARDS FROM A DISC PRODUCT THE BEAUTIFUL COLOR INVALUABLE DRUGS AND GIVEN EMPLOY MENT TO ARMIES OF MEN.

SCIENTISTS are now celebrating the semi-centennial of the "romance of chemistry," as the marvelous versatility of coal tar has been termed. Sir William Henry Perkin, who wrested the secret of vast industrial possibilities from the ugly by-product of the gas works, was recently entertained at a jubilee banquet in New York.

Before Perkin discovered the fact that wonderful dyeing material could be extracted from coal tar, that substance was considered worthless, useless, and was thrown away. Indeed, the disposition of the nauseous black liquid was a serious problem to the manufacturers of illuminating gas.

This once-useless and wasted product has been transformed, by the alchemy of science, into a mine of riches. From it come medicines to soothe us in our pain; beautiful colors, as varied as the rainbow, to satisfy our aesthetic tastes; perfumes as delicate as from a garden of flowers, a sweetening process with which sugar cannot be compared, and even powerful explosives that threaten to revolutionize warfare or banish it altogether.

Throughout the world 120,000 men are employed in manufacturing valuable products from what was once thrown away as waste. The coal-tar products of Germany alone sell for \$50,000,000 a year. Along these are fully 1,000 dyes.

No fewer than sixty different substances have been discovered in coal tar, and more are being brought to light every year. It is said that with a certain class of dyestuffs, combined with materials now known, 100,000,000 chemical bodies may be built by the expert in synthetic chemistry.

MANUFACTURE of coal-tar products is among the most remarkable of recent industrial developments; the business is unique in the history of commerce.

That veritable gold mine should have been found concealed in a factory waste that was exceedingly troublesome and difficult to dispose of was like discovering the jewel in the ugly head of the load or a realization of one of the extravagant dreams of the Arabian Nights.

Hundreds of articles now used in the arts and in medicine have their origin in the black fluid which formerly was only a source of annoyance to those who produced illuminating gas.

In 1856 William H. Perkin, then a youth of 18 years, was assistant to Dr. A. W. Hofmann, a distinguished German scientist, who was head of the Royal College of Chemistry in London. The chief made an Easter visit to his native land, leaving young Perkin in charge of the laboratory.

Quinine at that time was very expensive owing to the scarcity of the Peruvian bark from which it was obtained, and the young Englishman was making experiments to determine whether he could secure a substitute from coal-tar aniline.

Success did not attend his efforts, however, but while working thus alone in the laboratory, mixing, testing and experimenting, he accidentally obtained a dirty, black, unpromising precipitate.

What led him to test its dyeing qualities he has probably forgotten, but he found that, after purifying and dissolving it, the stuff possessed the property of dyeing wool and silk a beautiful violet-like color, which was named mauve.

This discovery turned the young Englishman's investigations into another channel, and when Dr. Hofmann returned from his vacation he found



...and was... of the new dye...
...Barrow in 1850... was turning out... the great aniline... world... an industry... France and Belgium, especially...
...combinations have been worked... together with some even more...
...for instance, is "dibenzylmetamidotetra...
...That for a modest looking azo-violet is even longer...
...Perkin made another great step forward in...
...when he began producing the valuable artif...
...madder, or Turkey-red, on a large scale. Be...
...fore that the artificial substance was merely a labo...
...ratory curiosity and its cost was so great as to be...
...prohibitive.

GIGANTIC FACTORIES
In the same way he laid the foundation of the artificial perfume industry. Early in the seventies, having accumulated a fortune, he retired from business and has since devoted himself to scientific research.

He had started the world, however, upon a new line of industry. German scientists took up the possibility of coal-tar products and have developed the gold mine persistently and effectively.

Today five of the principal coal-tar product factories of Germany are valued at \$25,000,000. Their output goes to all parts of the world. At one of these 4,500 men are employed, including 1,900 skilled artisans, 500 clerks, 175 engineers and 145 graduated chemists. The firm owns 1,900 German patents and 1,400 others throughout the remainder of Europe and in the United States.

One English dye factory employs 4,000 workers, including 80 research chemists. These examples indicate what an enormous business has sprung from a once-worthless material.

In the manufacture of coal gas, the coal, usually cannel, is heated in large iron tubes or retorts and is decomposed into four leading classes of substance—coal gas, ammonia and water, coal tar and coke. In proportion, coal gas forms 22.25 per cent.; ammonia and water, 9.25; coal tar, 8.50, and coke, 60 per cent.

SCENTS FOR SOAPS
Benzene is one of the important substances found in coal tar, having been discovered by Michael Faraday in 1825. It is now used in great quantities for the production of aniline and also a powerful perfume called essence of mirbane, or artificial oil of bitter almonds.

No less than 150 tons of this perfume is used annually in Europe for scenting soaps and other toilet articles. The usefulness of benzene in cleaning goods is known in every household.

Another substance found in coal tar is naphthalene, from which some of the most beautiful colors come, ranging from a buttercup yellow to reds, pinks, greens and scarlets. Naphthalene is highly prized by naturalists for preserving moths, butterflies and other insects.

From the substance known as anthracene the popular color Turkey red is obtained. Since the time when this was first known it had been produced from the roots of the madder plant, largely cultivated in Russia, Turkey and France.

Aizarin, as the coloring principle of madder is called, has the property of forming various different hues with different chemicals. A piece of calico, printed with several chemicals and given a

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