

and containing 15 grains of gunpowder, a conical bullet, at 15 yards range, which gave an average penetration of 1-16th into deal. Six rounds were then fired with 10 grains of gun paper, and a conical bullet, at same range, and gave an average penetration of $1\frac{1}{2}$ into deal. Here was 33 per cent. less of paper than of powder, and greater penetration with paper. Six rounds followed with an increased charge of 15 grains of gun paper, and a conical bullet, at the same range, and at each shot the bullet passed through a 3-inch deal. At 29 yards range 12 grains of the paper, fired from a pistol of 54 gauge (44-inch) sent a heavier bullet through a 3-inch deal. A fouled revolver was preserved four days, but betrayed no symptoms of corrosion after using gun paper. It is expected that gun paper will be manufactured cheaper than gunpowder.—*London Artisan*

Importance of Rags.

The wealth that is brought into existence by manufactures, or reproduced from apparently valueless substances by the marvellous, transforming power of human ingenuity, impelled by human wants, is a subject of surprise, even to the thoughtful observer. Enormous quantities of refuse matter are transformed into healthful fruits, grains, vegetables, and flowers, by the liberation of their gases and the dissolution of their salts. Bones, discarded by the housewife as useless, are wrought into forms of use and beauty, but in no instance is the value of articles which have outlived one condition of usefulness, and been submitted to the re-creative power of manufacture, more apparent than in the change which rags undergo.

From time immemorial rags have been the symbol of poverty, worthlessness, and vileness, and, as such, are referred to in the Bible and in the earliest profane works. Their usefulness as a material for paper seems, however, to have been discovered several centuries ago. The oldest specimen of paper made from linen rags contains a treaty of peace between the kings of Aragon and Spain, bearing the date of 1178. Raw cotton was, however, used for paper making before this time. It is tolerably certain that mills for making paper from rags were operated in Spain as early as 1085 (*vide* "Chronology of paper and Paper Making," by J. Munsell.)

Rags, particularly cotton and linen rags, have been for many years one of the housewife's perquisites, and many a shining treasure in the kitchen and many an elegant teapot on the table, has borne witness to the thrift of the good woman in her practice of economical saving. All these rag-savings find their way to the paper mill. Their price has more than quadrupled since the diminution in the supply of cotton caused by the war. But the supply of this country is wholly inadequate to the demands of the manufacturers and the public. Once writing paper was not very generally used—at least, the people generally required but a small portion compared to the quantity they now demand. It might have been supposed that the increasing facilities of travel would have diminished the necessity for writing; but the contrary seems to be the case. Personal contact and mutual acquaintance beget new commercial alliances, and correspondence is necessary. The rags made in

this country constitute but a small portion of those used by American manufacturers. We imported for the quarter of the present year ending June 30th, rags to the value of \$426,766. In the ten years ending with 1865, the amount of rags imported was 209,883,718 pounds. Italy furnishes a large proportion of the rags brought into the United States. Everybody has heard of the Italian lazzaroni, who wears the scantiest dress of the filthiest rags, yet from this unpromising source nearly three-fourths of our supply comes.

Italy is the country of the open palm, and begging and rags go together. Begging there and in other parts of southern Europe, is as much a profession as any industrial pursuit in this country, and the uniform of rags is more important to its successful prosecution than is the Government livery to the soldier. Still, valuable as rags are to the professional beggar, and important as they may be to abject poverty, they are far more important to the world at large; for up to the present time no other material has been found to usurp their place as the basis for paper. Their scarcity and constantly enhancing value have stimulated ingenuity to provide a substitute, but it has not been so successful as could have been wished. Straw, wood, and other substances have been, and are now extensively used in the manufacture of the coarser papers, but nothing equals linen and cotton for the production of the firmer and finer qualities. Some of the European Governments, for this reason, have prohibited their exportation.

It is a little singular that advances in knowledge and refinement—the triumphs of intellect and the spread of intelligence—are so closely dependent upon the contributions of ignorance and poverty. Possibly the sheet upon which we are now writing, and the page that will bear to our thousands of readers these printed lines, were once the filthy rags that but half concealed the nakedness of a Neapolitan beggar or an Egyptian fellah. It is to be hoped that the transformation they have undergone is typical of the improvement which education and the arts are yet to work upon the meanest of the race.—*Scientific American*.

Heavy Forgings.

The most interesting and one of the most important problems in the production of heavy masses of wrought iron is that of the manufacture of large naval guns. Steel appears to be quite unsuited to the requirements of large-bore ordnance, and cast iron, despite the American practice, is a material upon which no one in this country would, we think, like to venture. As for wrought iron, it has a greater dynamic resistance than steel, that is, what it wants in tensile strength it makes up in extensibility. It may require a steel inner tube, but rather to prevent the percussive action of the powder gases upon the wrought iron than as a direct provision against bursting.

There are three modes of working by which we may expect to make perfectly sound iron forgings of any weight. The first is the forming of the pile from bars or slabs which have been surfaced by machine cutting, either planing, turning, boring, or drilling, as the form of the parts may require. This mode is followed by Mr. Ames in the manufacture of his guns, and it obviously affords