with the sun and the corona will be made during the six precious minutes of veiled sunlight. The contacts will be carefully noted for the correction of the lunar tables; the corona and its spectrum will be accurately photographed; the chromosphere will be examined with the spectroscope both before and after totality; a new polariscope will be tried; and meteorological instruments will be used for studying radiation and other phenomena.

The tropical locality of the place of observation is favorable for clear weather on the momentous occasion. There is every reason to anticipate that discoveries will be made and observations confirmed that will increase our knowledge of the solar surroundings and reflect great honor on the astronomers who braved the dangers of the deep to wrest from the eclipsed sun a few of the secrets at all other times securely hidden beneath the dazzling brightness of his beams.

ENGLISH NAIL MAKERS AND THEIR WRETCHEDNESS.

Those who are so apt to jump at the conclusion in the abstract that machinery and invention throw manual labor out of employment, and so encourage pauperism, would do well to take a lesson from some of the industries which are carried on by hand work, and study the phases which they present One of these pictures, which quite eclipses the "Song of the Shirt" for squalor and wretchedness, has just been drawn by Mr. Robert P. Porter, in the *Tribune*. Mr. Porter was a member of the late Tariff Commission, and is clearly a close observer of matters concerning industrial labor. From his last letter we gather the following:

The country which Mr. Porter visited was the "Lye Waste" region in the Back Country—a district located partly in Stafford and partly in Worcester, England. In this district, situated seven miles from the great manufacturing industries of Birmingham, and dismal beyond description, is to be found an army of 24,000 persons engaged in making nails and rivets by hand. A place where only wreck and ruin, squalor, filth, and wretchedness abound, it is yet peopled by some of the most industrious people in England. The work of nail and rivet making is done in little smithies attached to the hovels, which are filthy and horrible beyond description. The father, mother, and children all engage in the industry, while the wages of two parents and a daughter, say of fourteen, are barely sufficient to keep the family from starving. Mr. Porter puts it in this wise: An expert nailer, working steadily from Monday morning to Friday night, can only make two and a half bundles of iron rods into nails, for which he gets 6s. 7½d. per bundle, or for his week's work, 16s. 8d., exactly $4. Now, his wife, by working every moment of her spare time and late into the night—neglecting the wretched little children—can make a bundle of commoner nails, for which she is paid 3s. 1d., and the little half-starved, stunted girl of twelve, with her brown arms and steady, unerring aim, will hammer out half a bundle, 1s. 6½d. Total earnings of an industrious and hard working family, three at the forge, for the entire week:

	English money.	*United States money.*
Father	16s. 8d.	$4 00
Mother	3s. 1d.	74
Daughter	1s. 7½d.	39
Total gross earnings of the family per week	21s. 4½d.	$5 13

But out of this pittance must come 3d. for carriage of iron from the "fogger's" and returning the nails, 1s. for the smithy fire, and 3d. for the wear of tools. Net earnings, $4.77 per week—the united earnings of three industrious, sober persons.

The saddest feature of this business is that the young women should be allowed to work at the machines called "alives," heavy machines made of iron and working with a treadle, employed in flattening the heads of the large eight-inch bolts. Hundreds of women work at these machines, and do not earn over $1.25 a week, and this work has been done in this way for a century. The poor operatives scarcely have an additional comfort over what was obtainable a hundred years ago.

The effect of such work and such surroundings upon the morals of the community are what might be expected. We have no reason to believe the picture at all overdrawn which describes the young women as livingmost wretchedly. Not only do they marry early—several girls not over seventeen being pointed out to Mr. Porter as mothers of children two and three years of age—but the London *Standard* tells a story appalling for its wretchedness. According to that journal, "women within a few days of their confinement have been known to work in the agony of exhaustion, in order to earn a few pence at the 'hearth'—not the 'hearth' of home, but the hearth of the 'forge'; they have been known to return to work in a day or two after childbirth, emaciated in constitution, weak and weary for the want of simple nourishment. Their children, ragged and ill fed, have had to lead miserable and wretched lives, with no hope before them but a life of wickedness and vice.'

It goes without saying that the remedy for such a state of slavery is emigration. The United States may not be a paradise where gold grows in the streets and diamonds crystallize on trees; but it at least is a country where such squalor and wretchedness are comparatively unknown. And in this condition of affairs as is here described some of our large manufactories may find a hint for their supply, and no form of philanthropy could convey the spirit of a truer beneficence than that which should lift such a people out of their squalor, and surround them by the comforts, the earnings, and, we may add, leisure as well, which are to be met with in so many of the industrial towns of the United States.

HOT AIR FOR BOILER FURNACES.

The use of *hot air* for feeding the furnaces of boilers for generating steam where the heating of air is accomplished by conserving the heat of the waste products of combustion, and also the exhaust steam from engines and other sources, has been applied with much profit and satisfaction in a large establishment in this city, where its adoption has resulted in a decided saving in the consumption of coal, as indicated by an evaporating power of seventeen pounds of water to the pound of coal. In addition to this, one of the serious troubles and sources of waste in the ordinary methods of firing, viz., the slicing and cleaning of fires, is avoided. In this case it is done only at the end of the day.

In this apparatus, the draught power of the great chimney is alone sufficient to overcome the friction of the air in passing over the large surfaces of the heaters.

The first increment of heat is received by the air from a large surface condenser, into which the exhaust steam from the various engines and other appliances is discharged.

The temperature of the air after leaving the condenser ranges from 150° to 175°, varying with the temperature of the external air.

It then enters the pipes of a flue heater, consisting of a chamber placed between the boiler and the chimney and crossed by a large number of thin cast iron pipes arranged in sections, so that the air enters at the end next to the chimney, or coolest end of the heater, and emerges at the end next to the boiler, or hottest end; where the temperature as observed by a pyrometer, is found to be from 375° to 400° Fahr., at which temperature the air is drawn beneath the grate bars.

At several places, or between the doors, are inserted in the boiler setting a number of pipes with dampers, connecting the ash pit with the fire chamber, so that a part of the hot air, as regulated by the dampers, can be thrown into the fire chamber for perfecting the combustion of the gases.

The pressure carried in this boiler, which is of peculiar construction, is 110 pounds per square inch.

The appearance of the pea coal upon the grate, and the combustion of the gases, as observed through the peep holes, are highly characteristic of this system.

The coal appears of a dull red color, while the activity in the motion of the gases in the combustion chamber is remarkable.

In this condition of the fire, no clinker is made, while the coal seems to be partially vaporized, and the combustion completed above its surface.

The coal is fed in in the usual way, at intervals of one-half to three-quarters of an hour, in thin sheets; the grate carrying at no time a greater depth than six inches.

At the end of the day's firing the coal is allowed to burn down, when the fire is hauled from the grate, a new fire being built every morning.

No clinkers are found in the ashes and debris hauled from the grate; the fire bed does not become hot enough to form clinker.

In trials made by alternating a cold draught with the hot air draught, some similar effects were noticed. Upon closing the damper of the hot draught inlet, and also the dampers of the fire chamber connections, and opening the ash pit doors, so as to give the fires a cold draught as in ordinary boiler furnaces, the coal began to brighten and finally became white hot within the mass.

The volume of flame in the combustion chamber decreased; the pressure fell in a short time from 110 pounds to 90 pounds, showing very vividly that the combustion was going on within the coal bed instead of above it. In a short time the fires began to clinker, and recourse was had to dressing and cleaning the fires. This, on a grate of about 160 square feet with eight doors, was no light work.

The experiments seem to have fully confirmed the value of the hot air draught, and to finally establish it as an improvement parallel with the hot blast in the iron furnace.

It has been in constant use for several years. Its only objection seems to be the large cost of the heaters.

SWEARING BY TELEPHONE.

A quite practical question from an ethical point of view has just been decided, involving the morality of the telephone—whether one using its facilities is entitled to prostitute them to the furtherance of profanity; in other words, is a man entitled to swear by telephone, and will the courts protect him in the use of the telephone for that purpose? A case involving this issue came up recently in an Ohio town, where a party who used the telephone was addicted to the use of profane expressions in his communications.

He was repeatedly requested to cease his profanity, but refused. Then the company attempted to take the instrument away, and suit was brought to prevent them from doing so. The company had a rule prohibiting the use of "improper or vulgar language" in telephonic communications; and under this regulation they rested their right to remove the instrument. After hearing argument the court held that the company's claim was good, and that they had an unquestioned right to remove the instrument. In rendering his decision the judge said: "The telephone reaches into many family circles; and it must be remembered that it is possible, from the peculiar arrangement of the instrument, that a communication intended for one individual shall reach another. All communications should therefore be in proper language. Moreover, in many cases the operators in the exchanges are refined ladies, and, even beyond this, all operators should be protected from insult." And so that instrument was removed and that swearer's profanity is not to be spread over the country by electricity. Probably good law, and undoubtedly good morals.

A New System of Treating Fecal Matter.

At a recent meeting of the Society of Engineers, London, a paper was read by Mr. Harry Olrick on the above subject, of which the following is an abstract: The almost universal system of water home sewage adopted when a city is near a river has given rise to a very grave inquiry as to whether this should not give place to some other method of disposal and utilization, which will not pollute the rivers. The pail system, apart from a sentimental view of the case, seems to work well in such towns as Manchester, Birmingham, Warrington, Rochdale, and others, the board of health of Manchester claiming that since the adoption of this system the cases of zymotic diseases have greatly decreased. They, like numerous other towns, are making manure out of fecal matter, besides treating and utilizing the other large amount of refuse, and although doing a considerable amount of work which does not produce revenue, they are not only self sustaining, but work at a profit. The new system which the author calls particular attention to has been worked out by Baron De Podewils, of Munchen, and is claimed to be an improvement on other systems, from the facts that the operations of the factory are comparatively automatic, that no unpleasant odor can arise, since the operations are all performed in closed vessels, that by a system of quadruple evaporation the fuel necessary is reduced to a minimum, and the resultant manure is of high quality, and is sold at from £9 to £10 per ton.

A factory has been erected by the Baron at Augsburg, in Bavaria, which is designed to deal with the excrement of about 17,000 inhabitants, or about 7,000 cubic meters per annum. The fecal matters are deposited in air-tight tanks, the gases generated being drawn under the steam boiler and burned. From these tanks the matter is drawn into a mixer provided with revolving arms, where a proportion of sulphuric acid is added; the effect of this is to generate carbonic acid and other gases which are conveyed away to be burned. From the mixer the fecal matter is forced into a fumigating pan; this pan is provided with hollow revolving arms which curve down to the bottom of the pan. Part of the products of combustion from the steam boiler are induced through the fecal matter by way of the hollow arms, and pass away, together with the gases generated, through an exhauster to the furnace of the boiler. From the fumigator a *monte-jus* forces the matter into a series of four evaporators, the vapors of one serving to evaporate the moisture from the next at a lower temperature and below atmospheric pressure, thus saving 75 per cent of the fuel ordinarily required to produce the same result. These evaporators have a temperature varying from 140° to 248° Fahr. From the evaporators the *monte-jus* forces the by this time pasty mass into a tank provided with a bucket wheel. This tank is placed above the final drying machine, which accomplishes the most difficult part of the whole process, viz., evaporating the remainder of the 95 per cent of moisture originally contained in the fecal matter, when it has reached a peculiarly tenacious and sticky stage. This machine consists of steam jacketed ring-shaped plates, on which the pulp is thinly spread by means of a rotating spout attached to a revolving hollow spindle, which conveys the pulp from the overhead tank fed by the bucket wheel.

After this layer has remained on the plate a few minutes it is scraped off by knives, also attached to the revolving spindle, and drops into a chute, whence it passes, by means of an elevator, into a disintegrator. This is the end of the process, a manure being produced in the shape of powder containing less than 9 per cent of moisture, 8 to 10 per cent of nitrogen, 3 to 4 per cent of alkalies, and 3 to 4 per cent of phosphoric acid, and consequently worth now as much as imported guano. This factory has been in operation nearly three years, and although laboring under the disadvantage of having to use coal as fuel at 23s. per ton, the proprietor has been able to make 20 per cent dividends. Another factory has been erected at Stuttgart with equally good results. At Augsburg a pail system is in use. At Stuttgart the cesspool is general. The author calculates that with a population such as England possesses, manure weighing 600,000 tons, and of a low estimated value of £4,000,000, is annually allowed to poison the air and water, instead of being permitted to return to the soil as Nature intended.

Another Fast Ocean Steamer.

The Fulda is the name of a new ship lately built in Scotland for service between New York and Bremen. She is a magnificent vessel of 5,124 tons gross, built by John Elder & Co., of Glasgow. The vessel lately went on a run extending over six hours, the trip being prolonged from Cumbrae Light to Corsewall Light, beyond the mouth of Loch Ryan, and back again. Over that great stretch of sea, and the time mentioned, with the tide against her both ways, she attained, says *Engineering*, the extraordinary speed of 17·803 knots, or upward of 20¾ statute miles per hour, a speed which has never yet been exceeded by any other great ocean steamer, with the exception of the Alaska and the Stirling, which were also built in Fairfield Shipyard.