

whole line in the galley is perfectly justified. When ever the space-key is depressed, the fact is registered in the calculating device, which is seen at the rear of the machine, directly back of the magazine. When the line is ready to be sent to the justifying mechanism, its shortage is automatically measured and recorded by the calculating mechanism. The calculator having registered, say, six spaces for the line, and thirty-three hundredths of an inch space to be filled, sets in position the mechanism for ejecting six spaces, selecting them from the ten sizes in the space magazines, and they are then pushed into line as the words are separated. It will be seen that the keyboard operator need never consider justification at all, changes in the measure not even interfering with it, nor do the corrections made by hand. The whole operation of justifying a line occupies but a few seconds' time, so that the justified line is always out of the way before the operator can finish another line and present it to the justifying mechanism. When the last word of a line is reached the line is at once pushed down into the galley with the matter that precedes it. The machine is provided with various safety devices to protect it from accidents, broken type, etc.

The type matter which has been set can be used for printing direct or for electrotyping, and is then ready for distribution. The types are specially nicked for distribution. The dead matter is placed on the galley of the distributor in considerable quantity. The distributor, like the composing machine, handles the type irrespective of its condition. The galley mechanism presses the type firmly against the top, so that the upper line is lifted off and pushed into a raceway. From the forward end of this line rotating carriers take off the types with great rapidity and transfer them to the proper channels which radiate above the center of the distributor. Battered types or dirt in the nicks releases a suitable lock, which stops the machine and allows the operator to remove it without damage to the mechanism.

The general design and construction of the machine is in accord with the latest scientific knowledge. The cams are made on an especially designed machine that produces highly accurate results.

Oil for Marine Uses.

In spite of the experiments and dissertations upon the relative values of coal and oil as fuel, comparative tests are constantly made. The subject is so fascinating to engineers that they will not abandon it. A Dutch torpedo boat constructed by Yarrow & Co. was recently fitted up to burn both coal and oil as fuel, the latter being merely supplementary, to be used only when high speed is needed for a short time. The oil tank was carried on deck, so that in case of being struck during an engagement the oil would be discharged overboard instead of in the hold; steam was used to spray the oil through the burners, the loss of fresh water through this cause being slight, owing to the short time it was used. During the coal trial the boiler pressure was 150 pounds per square inch, with one inch water pressure, the engines making 350 revolutions per minute; the speed of the vessel was $24\frac{1}{2}$ knots. Oil was then admitted into the boiler furnaces, coal still being burned at the same rate as before, with the result of increasing the pressure to 180 pounds, revolutions to 365 per minute, and the speed to $26\frac{1}{2}$ knots per hour. The coal burned was at the rate of 2,800 pounds per hour, and oil at 700 pounds per hour. A great advantage of this combined use of coal and oil is that the speed can be increased at once by the admission of oil, so that dirty fires are no bar to pursuit of an enemy on sight.

"Novel" Motor Traction Engine.

Under this caption foreign technical journals describe an oil engine said to have been recently invented in Germany, but which, as regards type and general action, was first brought out in this country by the late Richard Dudgeon. Some of the details of the German engine may vary from that of Mr. Dudgeon's, and the agent employed as motive power—oil vapor—is different from the latter, for he used steam; but the system was devised forty years ago, and the writer saw it in action in this city, with Dudgeon driving it. The motor in question consists of a friction roller, or pinion, working on the inside of a larger wheel, such as a locomotive tire, for instance. The tire-tread runs directly on the road and suitable framing is provided to carry the engine. The device itself proved very successful as to tractive power compared with other methods, the advantage being given as 60 per cent in its favor.

In publishing in our issue of April 13 some photographs of the new Pacific Mail steamship "Korea," we failed to state that the engraving of the launch was made from a copyrighted photograph by Samuel E. Rusk. The omission was made inadvertently, and we now take pleasure in giving the proper acknowledgment, the neglect of which at the time of publication we greatly regret.

Engineering Notes

A carboniferous deposit has been discovered on the coast of Iceland. The coal is excellent in quality.

The Hamburg-American Line has arranged for a tank holding about 16,000 barrels, to be placed in the Hamburg petroleum harbor, for the storage of liquid fuel for the use of vessels of their line.

The London County Council have recently placed a new float upon the River Thames, driven by liquid fuel. By means of a large burner full steam is raised in a very few minutes. The special type of burner known as the Clarkson, which is utilized, vaporizes the oil, and then mixing the vapor with the air produces an intensely hot flame, which has the additional advantage of being almost smokeless.

Experiments are being carried out by the British Admiralty for the employment of liquid fuel in the smaller ships of the navy. A special system of burning the oil is being tried, in which the liquid is distributed on a bed of coal and firebrick by means of a steam spray and there ignited. The low-flash Borneo oil is being utilized, as it has been found preferable to the Russian oil for this purpose. Liquid fuel is much more advantageous and economical for small craft, but the greatest difficulty encountered is the maintenance of the steam pressure. Once this difficulty has been satisfactorily surmounted liquid fuel will be extensively employed in the navy.

During the submerged experiments with the French submarine boat "Narval," especially in those cases where the vessel has remained under water for a prolonged length of time, the crew have suffered from a peculiar sickness. It has been found impossible to account for this curious malady, and the Ministry of Marine has issued a regulation that all men in future recruited for submarine boats must undergo a rigorous medical examination. The sickness is believed to be due to constitutional causes, but doctors are now accompanying the submarine boats during the submerged trials to study the indisposition and to ascertain its cause if possible.

The new British Admiralty Board has on several occasions recently displayed its readiness to discard the cloak of conservatism which has so long characterized it, by introducing several new features, and by introducing modern plants in the shipyards. One of the latest evidences of this progress is the overhauling of the plant in Portsmouth dockyard, the premier shipbuilding yard of the country, and the installation of up-to-date American labor-saving devices. Most of the machinery at present in the dockyard is from twenty to thirty years old, and consequently is quite obsolete. An American pneumatic plant for riveting and drilling is to be attached to one slip, and if it proves thoroughly satisfactory further plants will be provided to the other building slips. Several electric calkers are also to be introduced, together with electric drillers, while the traveling cranes in the various departments will be driven by the same motive power. It is intended that electricity shall be utilized as the motive power in connection with all the heavy machinery.

In view of the agitation there is in this country for three-cent car fares, a brief account of the cheap traveling facilities in Europe is interesting. The facts have been collected by the British ambassadors in Germany, France, and Belgium respectively, and have been dispatched by them to the British Foreign Office, London, and published as a Parliamentary paper. Belgium offers the greatest and cheapest facilities for traveling. The state, which owns the railroads, issues five different types of tickets to the work people living in the neighborhood of the towns in which they are employed, including tickets, single or round-trip, for six and seven consecutive days per week, and tickets for one round journey each week, at considerable reductions upon the ordinary tariff. For a single journey of five miles on six days of the week, a total charge of fourteen cents is made, and for the six round trips twenty-two cents is charged. Traveling upon the surface street cars is cheaper still. In Brussels the company which controls the whole of the street tramways in the city is compelled to issue to workmen up to 8 A. M., and in the evenings between 7 P. M. and 8 P. M., single tickets on week days at a maximum charge of two cents any distance, including one transfer. When the tramways of Antwerp have been consolidated into one company, which will be accomplished in a few weeks' time, the same regulation will apply, and in this instance it will be possible for a man to travel $27\frac{1}{2}$ miles for his two cents. In France the workpeople enjoy a reduction of 80 per cent upon the ordinary third-class fares upon the railroads. On the German imperial railways in Alsace-Lorraine the monthly commutation tickets for workmen average about one-fifth of a cent per mile, and on the Prussian state railroads, upon which weekly commutation tickets are issued, the rate is a fraction higher.

Correspondence.

Under the Lilacs.

To the Editor of the SCIENTIFIC AMERICAN:

Was it the attempted application of the doctrine of territorial expansion; was it a case of forcing a higher order of civilization upon an energetic and unwilling race; was it retaliation for real or fancied insult to national honor; was it, perhaps, because of an interest in the slave trade or a gold mine or a diamond field; was it any or none of these reasons that led to the terrific and decisive battles of which I was an interested witness some years ago?

It will perhaps never be determined what were the causes underlying a struggle of three days' duration, marked by carnage, feats of strength and deeds of valor such as it is rarely the lot of historian to record.

I was sitting one summer afternoon in the shadow of my cottage near a stunted lilac bush, when my attention was attracted to a horde of large black ants crossing a narrow roadway which lay between my house and that of a neighbor in the same yard.

Their objective point, I soon perceived, was the foot of the lilac, the ground around which had been honey-combed by little red ants less than half as large as the others. There seemed to be an unusual excitement here. Possibly a sentry or scout had brought news to the colony of the approaching army. At least they were not being attacked unawares. The invaders were met near the foot of the bush, and the war was on.

The battle ground was confined to a space perhaps three feet square, but here among the hillocks and ravines in miniature, all the tragedies and triumphs of war were enacted.

There was at first arrangement and order when van met van, but the conflict soon resolved itself into a general catch-as-catch-can encounter. Woe to the red ant luckless enough to get into the jaws of its larger foe. One closing up of those powerful instruments and a crushed, helpless mass was flung aside.

The smaller, however, had the advantage both in numbers and agility, and fought in pairs or triplets. Thus, while the black ant generally killed one or more of its antagonists, it was itself doomed.

The duration of a battle varied from five to fifteen minutes, when, all at once, hostilities would cease by the disappearance of the invaders, to be as suddenly renewed later.

It was pathetic during these periods of truce to note the casualties and the movements on the fateful field. Busy little army surgeons, or possibly members of the Red Cross corps, hurried from one mangled body to another. Sometimes a feeble response on the part of the wounded soldier to the anxious inquiry of the relief was noticeable. The solicitous and universal sympathy of the unharmed for their less fortunate companions was a sight never to be forgotten. The ground was strewn with bodies in all stages of dismemberment—legs gone, antennæ missing, head severed from the body, the body itself sectioned. Here and there one mortally wounded dragged itself slowly and painfully to some obscure spot to die. Others were helped away to a place of security, but in such a condition that it is safe to infer they passed their remaining days in a hospital or some home for the disabled.

For three days in at least as many battles each day the conflict raged. Each day witnessed a perceptible thinning out of the ranks, but the vigor and spirit of the contest kept up till near the close.

Desirous of knowing what effect the presence of strange surroundings would have on the combatants, I procured a large glass dish and captured several of both species. This I repeated at various times. Invariably, while at first trying to escape, upon becoming aware of each other's presence they grappled and fought to the death. Valor, honor, hatred, revenge (What was it?) dominated entirely over fear.

Against the stubborn resistance and greater numbers of their antagonists the invaders could not hold out. A panic finally seized the survivors such as comes upon human warriors—an unutterable, unreasoning fear, and, thoroughly defeated in their object, whatever it might have been, for days after hostilities ceased any unusual noise near their dwellings would send each individual hurriedly to shelter as if an avenger were at its heels.

The evidences of war having been removed from the battlefield, the stunted lilac once more towered above homes in which thrift and courage went far to redeem the losses and promised a future over which no gloom could cast a shadow.

Muncie, Ind.

M. M. SHERRICK.

Successful Trial of the Santos-Dumont Balloon.

The motor-driven balloon of M. Santos-Dumont had a trial on July 12, the voyage being from St. Cloud around the Eiffel Tower at Paris and return. According to cable reports the speed was about 37 miles an hour. The height of the balloon above the ground varied from 320 to 890 feet. The aeronaut descended successfully six times upon foreordained spots.