

## NEW METHOD OF INFLATING BALLOONS IN WAR TIME.

BY EDWARD J. FORSTER.

At the present moment, when attention is naturally attracted to every phase of war, a development of ballooning which will tend to simplify the use of balloons in war time, and add immensely to their value, deserves both a description and an explanation. The improvement is due to the ingenuity of Mr. J. Nevil Maskelyne. It occurred to Mr. Maskelyne that though hot-air balloons were no novelty, in fact they have been more or less familiar to the public for a century, yet for practical purposes, the hydrogen or gas-filled balloon was the only one generally used. He determined to experiment with hot-air balloons, filling them by means of vaporized petroleum or crystal oil.

He at once called in the active co-operation of a widely-known and most successful aeronautical scientist, the Rev. J. M. Bacon. Together these two gentlemen, through a long series of experiments, succeeded in demonstrating not only the practicability of inflating balloons in this way, but also in proving what immense possibilities wait on the new discovery. The

method followed is briefly this: A specially-constructed vaporizer or burner with an oil consumption power of eight gallons per hour is placed in a staging, above which is held the envelope of the balloon, connected with the burner by a flexible asbestos tube. When the vaporizer is working at full power, the balloon expands with marvelous rapidity. For instance, the balloon shown in our interesting series of photographic illustrations is an enormous envelope of 70,000 cubic feet capacity, having a diameter of 50 feet, and a height of nearly 70 feet; yet this bag is fully inflated well under half an hour. Fully to realize the rapidity of inflations, it is necessary to note the illustrations which show the different stages. Even to the uninitiated it will occur that such a method of inflation must mean much in time of war. Petroleum is a commodity obtainable almost anywhere—cheap, portable, and readily used in the manner indicated. The balloon envelope, the car, the vaporizer, and pump all together are brought down to size and weight which makes the problem of transport easy of solution. One very successful experiment was the inflation of a small balloon of 2,000 cubic feet capacity with a camera attached, electrically connected by means of the cable holding the balloon captive, thus allowing photographs to be taken of the surrounding country. The balloon can be inflated, the ascent made, the photograph taken, and the balloon brought down again all in two minutes.

An improvement in car seats has been made by B. Repsdorph, of Houston, Texas, by which it is possible to make a very comfortable bed out of an ordinary car seat. The inventor thinks his patent will be a boon to the colored persons of his and other southern States where they are not allowed the privilege of the cars occupied by white persons. The seat itself is but little different from that of the ordinary design, but it is supplied with a lock which holds it rigidly after it has been made up into a bed.

## Experiments with Aluminium Alloys.

The Aluminium Company of Neuhausen, Switzerland, having requested the Material-testing Bureau of the Zurich Polytechnic to make for them a series of tests of aluminium-bronze, as also to discover what influence certain given additions of aluminium will exert upon the peculiar properties of brass, we give

tearing strains, as well as the tests under the hammer and the cold breaking tests.

In the cold breaking tests several of the aluminium bronzes demonstrated considerable toughness, which corresponds to the resistance to the pull in the tearing process. Those samples which were tested while red-hot disclosed an excellent degree of toughness for all

the aluminium bronzes which were heated to about 600 deg. C.

The results for ductility of cast metal are given below. Pure aluminium is malleable cold, as are aluminium bronzes in general, and yet if the aluminium be increased in the alloy the ductility becomes less and less, until with a 10 per cent addition the possibility of beating out the alloy ceases altogether. The presence of from 2 per cent to 3 per cent of silicon renders these bronzes very brittle when cold and next to impossible to bring into any shape.

When heated, however, aluminum bronzes are very plastic, soft, and moldable, and consequently malleable and roll out well; they satisfy the highest demands as to drawing, spreading out in sheets, splitting, and punching. The most favorable temperature for ductility is light cherry red. Increase of aluminium or silicon lowers the required

forging temperature.

Under the tests for abrasion by rubbing upon a good and continually oiled cast-iron disk, the harder aluminium bronzes, those with less than 89.6 per cent of copper, showed less wear than two other bearing-metals which were tested at the same time; but quite the contrary was the case with the softer aluminium bronzes.

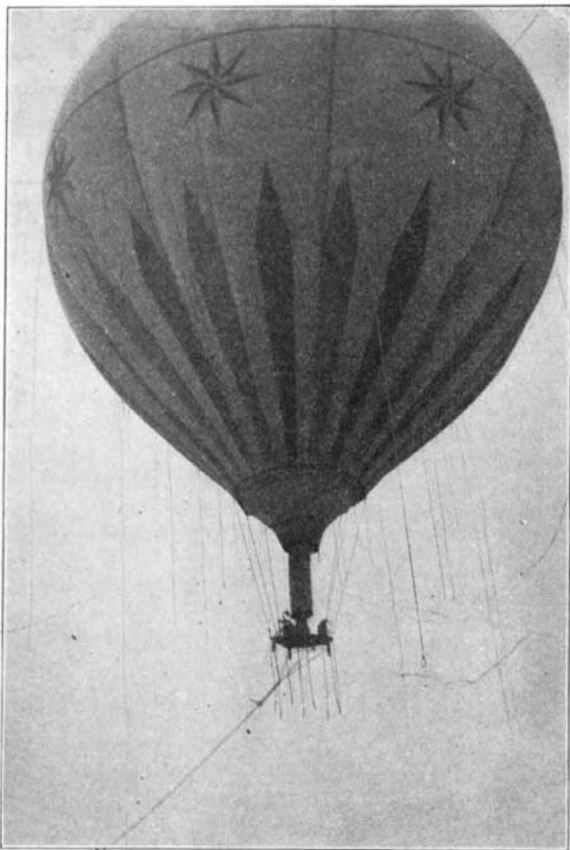
Bronzes with less than 6 per cent of aluminium became hot at once and rubbed off rapidly.

From this we see that the employment of aluminium bronze for bearing metal is not beyond all possibilities. The material which offers the most favorable properties of stability for rolling purposes is that combination which contains between 8 per cent and 10 per cent of aluminium and silicon. Where more than 10 per cent is present, the product is too brittle, and with less than 8 per cent the stability is very low. The influence of iron is less marked. Those aluminium bronzes which showed the greatest extension in the

tearing process proved to be also the toughest in the cold breaking tests. In the red-hot breaking tests all bars were bent 180 deg., and at the bend pressed completely together. In this test only two samples showed traces of cross rupture.

Over four hundred applications in land condemnation proceedings have been filed in St. Louis and Lake counties of Minnesota by the Minnesota Canal and

Power Company, which proposes to impound the headwaters of the St. Louis River, for the purpose of supplying electricity to Duluth and vicinity. These applications cover the properties through which a proposed canal will run, and the operation will, it is announced, be a gigantic one, although the details have not yet been announced. Application has been made to the government for portions of many properties which have not yet passed out of its hands.



The Balloon Fully Inflated.



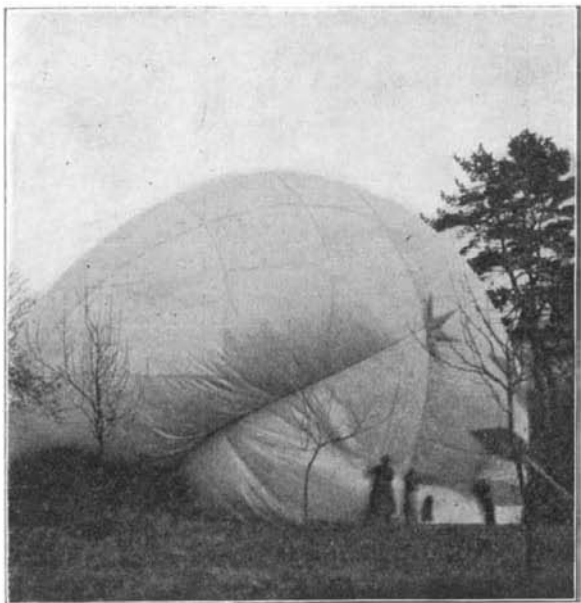
The Burner, Vaporizer, and Pump for Vaporizing the Oil.

from the Metalarbeiter the following results. Up to a certain point brass becomes harder as the aluminium is added, after which it becomes rapidly softer again.

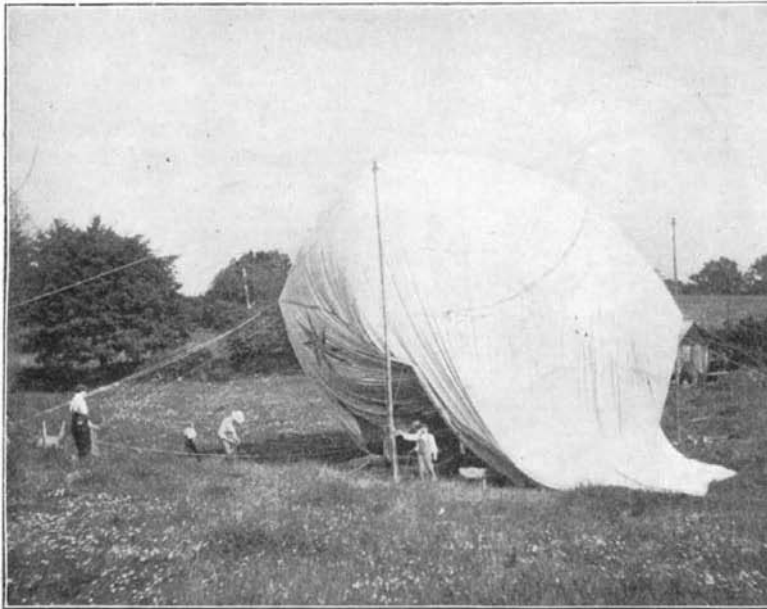
For the softer alloys the point of maximum stability or strength is reached with about 3.4 per cent of aluminium, for the harder alloys with about 1.4 per cent.

As the amount of aluminium increases, the tensile strength of brass decreases; in fact, more than two per cent of aluminium will render it too weak for any useful purpose. The experiments were not carried far enough to determine whether the brass would recover its lost tensile strength by the further addition of aluminium.

Small additions of silicon considerably increase its hardness, and also greatly diminish its resistance to the tearing strain. Iron is not present in sufficient quantity to have any perceptible influence upon the characteristics of the alloy. The effect of the different combination of the alloys upon the peculiar tenacity of the same is recognized from the facts that with the



The Balloon Partially Inflated.



Inflating the Balloon.

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increase of the percentage of aluminium from 5 per cent to 10 per cent, the stability or hardness increases, but the resistance to the parting strain decreases.

A combination of iron and silicon acts in exactly the same way. Furthermore, the experiments showed that the 10 per cent aluminium bronze, which contained also a compound of iron and silicon equal to 1.5 per cent of the whole, was too brittle for practical use, as was exemplified by the low resistance to the