14″ down to 8″ a satisfactory job by the old method of side lap riveting could not be made at a price to compare with cast iron.

But to-day we find spiral pipes being manufactured, under the Mephan Ferguson and other patents, to sizes ranging from 6″ to 21″, and at a cost of about one half that of cast iron pipes of exactly the same dimensions.

In this process the metal (steel) is rolled in long, narrow strips, each of which is bent spirally into a length of piping, in the same way as paper strips are rolled between the forefinger and thumb into "spills," etc. The advantage of this method is that the fibre of the metal being wound round in the helicoid gives each length of piping the full tensile strength of the material, the circumferential breaking of the joint usual in ordinary pipes being avoided. When the strip of steel is presented the machine seizes it and draws it through with a twisting motion. During the passage, the punching and riveting are done by other machinery working simultaneously so that the whole process is completed at one time. Greater rapidity of manufacture, and cheapness, together with superior strength, and less weight as compared with cast iron, are the advantages of this method of construction.

The works of the Spiral Steel Pipe Company of New Zealand Ltd., are situated conveniently in the heart of the town of Wanganui, and one's first impressions are prone to centre on the business-like aspect of things, as the grimy denizens of the works move about with the activity prompted by a management mindful of the large orders in hand. In the main building a huge stock of steel plating hoops, each 60ft. in length and wound spirally, stands handy to the three pipe making machines. These massive contrivances, which are to be seen in our illustration, have each a capacity of 350 ft. per diem, and into them the steel coils, slowly unwinding, are fed in an endless sheet, continuity of the feed being ensured by electric welding. With these machines we discover the actual process in which unfashioned material enters at one end, and comes out at the other complete in its marketable form. Perhaps the statement should be qualified by adding that the pipe machines punch and rivet the pipes, leaving the minor finishing touches to human hands.

After the full length pipe emerges from the machine—one is shown in that stage in our illustration—it is removed to the testing yard. Here each pipe is tested hydraulically to a pressure of from 300 to 500 lbs. per sq. in., and if found without flaw it is thereupon covered with hessian, a foundation thus being provided for the final coating of Trinidad bitumen and coal tar.

The two coating tanks filled with a seething mixture of bitumen,60%, and coal tar 40%. and heated to a temperature of 400° Fahr. are each 36 ft. in length, 4 ft. wide and 6 ft deep. Into these the pipes are carefully lowered and kept for twenty minutes. In that time the liquid, proof against both dirt and rust, has thoroughly permeated the hessian covering, and has besides effected a coating which prevents deterioration of the metal for years.

At first there were doubts as to the longevity of the pipe—as to whether it would corrode or perish earlier than the old-fashioned cast-iron article. That, however, is a phase that has long since been disposed of both in America and Australia, where the pipe has come into common use.

In bringing into commercial calculation the cheapness and portability of the Spiral Steel Pipe we must conclude that the heavy and expensive cast-iron article is now an antiquity. No modern engineer would recommend cast iron where the Mephan Ferguson process enables him to supply an equally efficient article at about half the cost. Wanganui, New Plymouth, Eltham, Fielding, Hawera, Auckland, Gisborne and Christchurch have all adopted the spiral pipe, and other governing bodies are falling into line as projected works are taken in hand.

Regarding the cost of the spiral pipe, it is interesting to note that when tenders were called by the Gisborne Borough Council for pipes for its water supply, the Mephan Ferguson steel pipe was selected, the cost being £38,000, while the next lowest, for cast-iron pipe, was £69,000. These figures convey more than we could put into a column of matter.

The Wanganui Company only makes the spiral pipe at their works whose maximum diameter is 6 to 21 inches, and the larger diameters are made by the locking-bar process at the other branch of the business at Auckland. The two Companies, though running independently of each other, are practically controlled by the same proprietary—Mr. A. Hatrick is chairman of directors of both Companies, and Mr. G. Smithies is manager—and it is safe to assume that with the present output of 1,000 ft. of pipe per diem, and with orders in hand to keep the works going at that pace for the next six months, the business of the Spiral Steel Pipe Company of New Zealand argues well for long establishment.

MASTERY OF THE AIR.

AEROPLANES AS CHEAP AS BICYCLES.

COLONEL J. D. Fullerton, R. E., lecturing before the Aeronautical Society. London on "Wings v. Screws," expressed the opinion that practical flyers would soon be as cheap as bicycles.

The lecture was illustrated by practical experiments with wing models designed by Major Moore. These were of the flying fox type.

By means of a clock spring, the wings were caused to flap up and down, and the model being placed on a groove-slide, a jerking forward movement of the contrivance took place, showing that an up and down movement of wings designed on this principle will produce a forward propulsion.

The conclusions arrived at by Colonel Fullerton were that the propeller in the form of a screw, as in a ship's propellor, is quite as efficient as the wing type, and that the former is the safer type as a machine fitted with bird-wing propellers only would be highly dangerous, if the motor were to stop accidentally when the wings were at an awkward angle.

Colonel Cody, the box-kite expert, stated that in his opinion wing machines would never be practicable.

M. Jose Weiss the well-known landscape painter, showed some successful model bird-flight wings with pieces of thin cardboard cut into the shape of a bird with outstretched wings, and weighted with pieces of lead to represent the weight of the bird's body. These gliders soared across the large hall of the Society of Arts in a series of curves, exactly imitating the flight of a dropping sea-gull.

A paradox of flight also demonstrated by experiment, is that the stronger the wind blowing against a certain form of curved wing-surface the less resistance does the bird offer to it!

This effect was described by the French Captain LaBrie, whose "Albatross" was illustrated in PROGRESS for March last. The same principle was the object of the researches and experiments of Lilienthal and the Brothers Wright; it has influenced the form of their "gliders" and aeroplanes; and their experience has enabled them to work out valuable tables of its effects.

Aerial Navigation.

THE fascination of forecasting the political effects of projected scientific developments has just claimed an eminent victim, in the person of Professor Rudol Martin, a German savant and writer of European celebrity. The professor has convinced himself that the problems of aereal navigation are so certain of triumphant solution in the immediate future, that by 1910 airships will be travelling about the world with the untrammelled freedom of swallows and something more than the speed of our fastest express trains. Proceeding from this hypothesis he has formulated and elaborated a theory from the German view point of the changes which the new agency of transit may be expected to work in the comity of nations; and he has published his conclusions in a book—"From Berlin to Bagdad"—which has excited great interest among German naval and military experts, and has caused somewhat of a sensation in Great Britain. Naturally, Professor Martin's theme is mainly concerned with the military uses and advantages of air ships. He assumes that all the nations will start building aerial fleets from the first moment practicable, in his opinion 1910. He then points out what he considers the overwhelming military advantages possessed by Germany in this new struggle for supremacy. Germany starts on a level with her rivals in the race; she has therefore no lee-way to make up, as in her attempt to wrest the sovereignty of the sea from Britain. Britain, of course, and other countries may build aerial fleets equal to hers; but Britain does not possess the great army without which it will be impossible to follow up the victories won by flying squadrons. Germany alone can do that and, granted that she can once obtain aerial supremacy, she could instantly overwhelm her enemies with millions of troops conveyed to any point she pleased by her flying transports. Throughout his book the professor deliberately directs his attention to Britain as Germany's natural enemy and destined victim.

Mr. W. T. Stead, on the other hand, considers that the development of the aeroplane will supply the convincing and compelling argument which is the only thing wanting for the universal agreement to substitute arbitration for war. He rejoices that the introduction of so deadly an element must abolish war, as it was abolished among the tribes of Central America, according to Warterton and Humbolt, by the discovery of a specially deadly poison with which arrows were coated.

Speed.

On a trial run on the lines from Berlin to Gossen, in Germany, part of the distance was covered at the rate of one hundred and thirty miles an hour.