Correspondence.

AN EARLY HELICOPTER.

To the Editor of the Scientific American:

I send you a brief account of the experiments in flying machines made about fifty years ago by my father, the late George W. Dow of Brooklyn, N. Y. He always had great faith in aerial navigation, and frequently asserted that when an engine should be constructed light enough and with sufficient power, it would be accomplished. His experiments were recently recalled to me, when I discovered among his papers a wood-engraving block which was used by your valuable paper about fifty years ago in publishing his original idea, which was that of lifting screw propellers that working vertically raised the car, and by inclining the shaft or shafts in any given direction, would carry it forward or steer as desired. I go back in memory to my childish distress when he cut one of my humming tops in two; and my subsequent delight when, after fastening blades or wings at an angle on the surface and using the spinning handle inversely, he caused it to soar gracefully into the air. Following this experiment he made a small model with four propellers on vertical shafts in the corners, and which easily flew about the room by means of clockwork machinery. It was shortly after your publication of my father's first crude idea that the flying top appeared from France, and I remember his questioning whether this toy was suggested by that publication or if, as not infrequently happens in the world's inventions, some Frenchman had been working at the same time on similar lines. At the present day engines light enough and strong enough having been made, my father's prophecy seems about being fulfilled; and it is not improbable that the lifting and steering will be accomplished in the manner which he conceived, perhaps in conjunction with some kind of an aeroplane, these having more recently come into successful prominence.

Wakefield, N. H. ABBOT LOW DOW.

SLIPPING OF WHEELS ON CURVES.

To the Editor of the Scientific American:

I am a constant reader of your paper, and consider it one of the best publications in America, but have noticed one or two errors recently. One of them is in your description of the Alaska-Yukon Exposition that is to be, in which it is stated that Mount Rainier is the highest mountain in the United States. California can lay claim to that distinction in Mount Whitney, which is 14,501 feet above sea level. This is the highest outside of Alaska. I live in the shadow of this mountain, and like all other residents of this community feel proud of our Mount Whitney.

Another is the often-asked question about the train going around the curve, and the outside wheel being compelled to travel faster than the inside one, etc. Your answer has been that the inside wheel would have to slip. I beg to differ with you, for the following reason: When the train is going around the curve, the momentum to go forward is inclined to cause the wheels to hug the rails close to the flanges of one wheel or one side, while the rail on the other side or inside curve is naturally away from the flange of the wheel. The wheel is larger near the flange than away from it, consequently the diameter of the wheel on the outside rail while going around the curve is greater than on the inside, and consequently travels faster. I think you will have no trouble in seeing the point.

Visalia, Cal. B. F. LIGGETT.

[When a train is rounding a curve, the resultant of gravity and centrifugal force inclines toward the outer rail. This produces an increased frictional resistance between the outer wheels and the outer rail, both on the tread and the flange. As the resistance to slipping is, other things being equal, proportional to the pressure, the inner wheels will be the first to slip. Theoretically, there is something in the suggestion that the outer wheel can travel a longer distance than the inner without the latter slipping, because the outer wheel rolls on a larger circumference of the coned surface, but in practice the taper of the wheels is not sufficient to make the difference, and has in recent years been reduced.—ED.]

SOME MORE LUNAR SUPERSTITIONS.

To the Editor of the Scientific American:

Reading your article, "Lunar Superstition and Potatoes," calls to mind many other equally as superstitious and uncalled-for ideas. Many farmers plant corn in the moon, kill hogs in the moon, deaden timber, build a fence, and do almost everything by the moon. As a basis many refer to the Scripture, Genesis, first chapter, fourteenth and sixteenth verses. But few people realize that the moon is as large when it is new as it is when it is full, and that the sun shines on the same amount all the time; and it is owing to position that makes the different phases of the moon. Some semi-scientific men claim that if corn is planted in the dark of the moon, when it comes up the nights are light and cause it to grow faster. Many regard the moon as a weather indicator. If it is on its back when new, it will rain within the first quarter. If it is on its point, the water has all spilled out and it will be a dry moon. Being north or south of an eastern or western line indicates cold or warm weather, not realizing that it has its regular path, and is approximately in the same position at the same time of the year each year.

McKenzie, Tenn. W. R. CRAWFORD.

SIGNALING TO MARS WITH MIRRORS.

To the Editor of the Scientific American:

In the Scientific American of May 15th, in an article on "Signaling to Mars," are these statements:

"A correspondent of the New York Sun, who states that he is a practical heliograph man, calls attention to a fact which seems to have been overlooked.

The heliograph man points out that a pocket mirror two inches square will do as much work as a mirror that is ten feet square. All that any mirror can do is to reflect a single image of the sun. He states that it is possible to flash from 6 to 48 miles with a shaving glass."

I have been thinking on the subject, and would like to submit the following. If there is anything wrong with the reasoning, please correct me.

Any plane mirror will reflect all of the sun's rays that fall upon it. Every boy has thrown sunlight on the wall or ceiling by a piece of glass. The spot of reflected sunlight is of the size and shape of the reflector, whether that be an irregular piece of glass, a shaving glass, or the family "looking glass." Those rays that enter the eye direct from the mirror form a single image of the sun, and that image will be larger or smaller, according to the distance of the mirror from the eye.

The diameter of the sun is about 32 min., circular measure, so 32 min. will be the "angle of vision" subtended by the sun. A little figuring will show that the arc of 32 min. is 0.0093 of the radius of a circle. If we consider the eye as the center of a circle, the distance of the mirror will be the radius. Therefore a mirror held at a distance from the eye will not take in a full image of the sun unless it has an angular diameter of 32 min. or an absolute diameter of 0.0093 of its distance from the eye.

At a distance of one yard, this diameter will be 0.334 inch; that is, the image of the sun, reflected in a mirror one yard away, will be about one-third of an inch in diameter. At 100 feet this image will be increased to 11.16 inches in diameter, and a mirror placed one mile distant would need to be 49.1 feet to reflect a full image of the sun. Every additional mile of distance would require 49.1 additional feet to the diameter of the mirror. To reflect millions of miles would require a *very large* mirror to give a full image of the sun; a "2-inch" or a "10-foot" mirror certainly would not.

This can be verified by observing the reflection of the sun in an ordinary window. If the observer be close to the window, he will see a small, round image of the sun; as he recedes from the window this image will increase in size, and at a distance of 50 or 75 rods the entire window will be lighted up with a single image of the sun. Often, while standing at the Pennsylvania Ferry in Jersey City, I have observed the image of the setting sun reflected from the high office buildings of New York, one mile distant, and that image extended over several windows. The shaving glass, or heliograph reflector, 4 inches in diameter, if more than 40 feet from the observer, will not reflect an entire image of the sun. While it may "flash a signal from 6 to 48 miles," that reflection will be but a *very, very* small portion of the full image of the sun.

From this we see that the amount of light reflected from a distant mirror is directly proportional to the surface of the reflector, and in signaling to Mars, large mirrors will be more powerful than small ones.

As to the practicability of the experiment, or its success, these are beyond the range of mathematics.

Elizabeth, N. J. GEORGE FLEMING.

The Current Supplement.

A new departure in locomotive construction is described in the opening article of the current SUPPLEMENT, No. 1743. The locomotive in question is fired with liquid fuel, and can be reversed without the use of any intermediate gearing, both the power and speed being controlled by altering the steam charge in the cylinder, without resorting to the expedient of different ratios of transmission. George P. Floyd, an old-time railway conductor, describes most interestingly the life of early conductors, men who were usually recruited from the ranks of stage-coach drivers. A Japanese engineer, Wadagaki, has made the suggestion of using the exhaust steam from the main engines in a turbine which should drive a turbo-compressor, taking the steam from the boilers and delivering it to the main engines in a compressed and superheated condition. A critical comment on this scheme is published. The successful management of a modern farm depends upon the efficiency of the equipment with which the work is performed. The repair of the equipment is a vital consideration. Mr. W. R. Beattie tells how the equipment can be kept in good order. James Arthur writes on ancient chariot wheels, and shows that the wheel can be traced back 3,500 years. Herbert Chatley's splendid paper on aero problems is concluded. Prof. F. Henrich reviews recent work in radio-activity. The pearl-button industry is described at length. Mr. C. H. Clark illuminatingly writes on magnetic ore separation and the electrical operation of mining machinery. The usual engineering notes, trade notes, and science notes will be found in their accustomed places.

The gasoline tank should be filled through a hose connection from the pump, or if, as in the largest garages, it is impracticable to run the cars to the pump, a portable tank on wheels, of a capacity of about fifty gallons, fitted with a pump to which is attached a hose, should be used. The portable wheel tank is run to the pump and filled, and can then be moved from car to car. Either of these methods of filling tanks reduces the fire risk to a minimum, as the gasoline is not exposed to the air, and cannot vaporize. These methods do away with the excuse for open pails and buckets partially filled with gasoline, and constantly giving off explosive vapor. The workmen should not be allowed to use gasoline for washing their hands or cleaning the cars. In either case the gasoline is pumped or poured on the floor and allowed to evaporate. To prevent this, the pump should be equipped with a lock, and the key kept by the foreman, or man in charge, so as to prevent the pumping of gasoline on the hands.

THE MANUFACTURE OF FRENCH POSTAGE STAMPS.

BY JACQUES BOYER.

All of the postage stamps, postal cards, letter cards, money orders, and pneumatic cards and envelopes which are used in France and the French colonies are made in the national factory in the Boulevard Brune, Paris, by 320 employees, men and women, who are appointed by the Secretary of Posts and Telegraphs. With the aid of the improved machines which are shown at work in the accompanying photographs, this small force of selected workers turns out the immense quantity of matter detailed below. The figures are for the year 1907.

Postage stamps (of which 1,500 millions are of the denomination of 10 centimes, equivalent to 2 cents)	2,700,000,000
Postal cards	20,000,000
Letter cards	45,000,000
Pneumatic cards	4,000,000
Pneumatic envelopes	400,000
Domestic money orders bound in books of 50 or 200	45,000,000
International money orders	2,000,000
Colonial stamps	50,000,000

In making postage stamps, the first step is to order from a celebrated artist the design of the engraving. The design is drawn on a large scale, and reduced by photography to the exact dimensions of the stamps. The reduced image is given to a skillful engraver, who engraves it upon wood or steel. When this engraving has been approved by the artist, it constitutes the original plate. From this plate, which does not bear any mark of value, an impression is taken in wax, if the plate is wood, or in lead if the plate is steel, and from this impression electrotypes are made. The electrotypes, having been carefully retouched, go back to the engraver, who inserts the figures of value. Thus is obtained a series of plates corresponding to the different denominations of stamps. From each of these plates impressions in lead are taken. These are grouped in fifties, and thus electrotyped. In order to strengthen the thin sheet of copper, which forms the "shell," or electrotype, its edges are turned up, and a backing of melted type metal is poured upon it. The plate thus obtained, after being further retouched by the engravers, is ready for printing.

One of our photographs shows artists examining shells with a lens, and erasing small defects with the burin.

The printing is done by the usual methods but, naturally, with very great care. Each sheet of stamps contains 300 or 600 stamps, and the operator must assure himself that every portion of the six or twelve engraving plates shall be subjected to exactly the proper degree of pressure. In this way it sometimes happens that several days elapse between the arrival of forms at the press and the actual impression.

The presses are of two different types, platen and cylinder. The former work less rapidly than the cylinder presses, and are used particularly for printing stamps in several colors. In order to facilitate the control of the operation, the edge of every sheet has impressed upon it the date, the number of the press, and the letter designating the pressman. We shall not go into details concerning the presses, most of which resemble those found in other modern pressrooms, but we shall describe more particularly the new rotary press designed by the Marinoni firm, for the purpose of printing money orders and postal notes, and purchased by the government at the commencement of 1908.

Previously, French money orders and postal notes had been printed on flat presses of various types, not capable of printing more than 1,000 per hour, and their manufacture included five impressions (the safety background, the main design, the numbers in color, the serial numbers in black, and the black in black). The new Marinoni press performs all these operations at once, and delivers sheets of ten money orders, completely printed and numbered, at the rate of 6,000 or 8,000 sheets per hour. The operation of the machine is shown in one of the photographs. A continuous band of paper, running from a reel, receives a first impression from a cylinder which carries the plates of the safety background, and a second impression on the face from another cylinder carrying the engravings of the main design. Simultaneously a series of printing drums carry numbers of three figures, which change at each turn of the press cylinder and are printed in color on the paper. On another series of drums are the numbers of six figures, which change for each fifty or one hundred sheets. A special mechanism allows this numbering to be done without any shock, despite the great speed of rotation. The serial numbers in black are impressed as the band unrolls, and at the same time the back receives its impression from two other cylinders. The printed blank is then cut into sheets, each containing ten postal orders, which are automatically arranged in piles of five and placed on a table which moves once for each one hundred sheets, so that the money orders which are to form a book are properly arranged and numbered and need only be cut from the pile of printed sheets. In order to arrange conveniently all these sheets by the old system, it is necessary to have an assembling table, behind which stand men who take a sheet from each pile as it passes before them. When the revolution is accomplished the book of money orders is complete. It is then taken to the binding machines, which fasten it with three wires and put on the cover.

To return to postage stamps: The printing finished, they are counted and go to the gumming machine, where an operator places the sheets on a cylinder which presses them against the gum roller. After this the sheets are seized by claws and carried by a long chain into the drying apparatus, which is formed of a series of vertical shafts of metal containing gas burners for the purpose of heating the air, which is kept in motion by fans. In these machines the sheets travel 350 to 400 feet in about ten minutes and are then dry. The two boys who receive them from the gumming machine have only to pile them regularly on the table. The gummed sheets, after being again counted, go to the perforating room, where they are perforated very rapidly by a machine. The sheets are cut in two or four pieces according to size, and are presented in piles of five to the machine, which instantly punches out thousands of minute disks. The 600 stamps are perforated in less time than it takes to describe the operation. The stamps then leave the factory for the storehouse of the responsible agent, where they are again counted.

In addition to postage stamps and money orders the government factory makes pneumatic envelopes, pneumatic cards or "*petits bleus*," stamped newspaper wrappers, letter cards, and postal cards. The envelopes and "*petits bleus*" are cut out by hundreds from the printed sheets. Then a girl inserts the pieces separately in an apparatus which folds and fastens them. The flap is then gummed by another machine. A workman lays the envelopes on long strips of canvas which, moving continuously, carries them to the gum roller and then to other endless bands arranged horizontally over a distance of 130 feet. At the end of this journey the envelopes, now dry, fall upon other

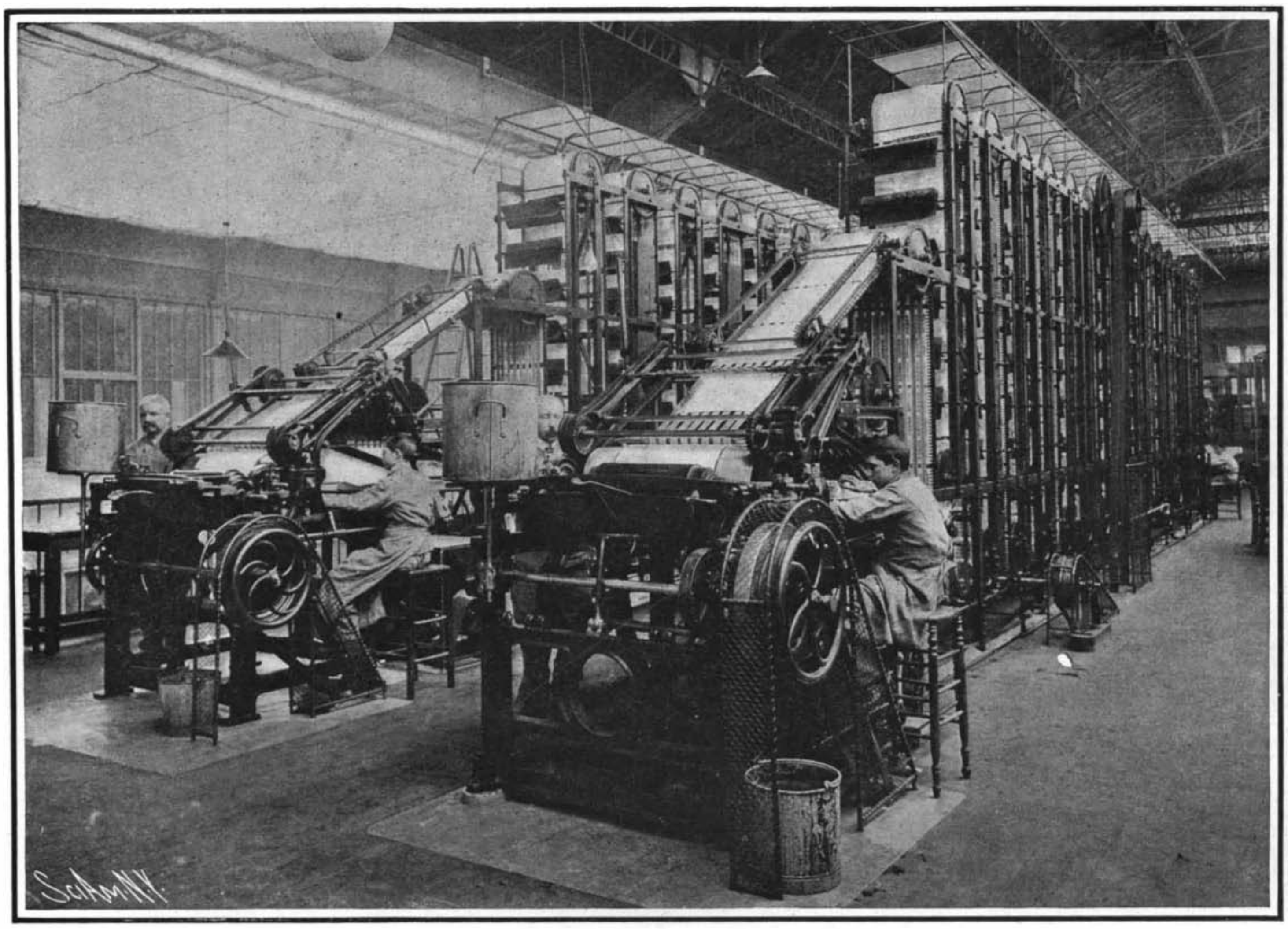


Fig. 1.—Gumming sheets of postage stamps by machine.

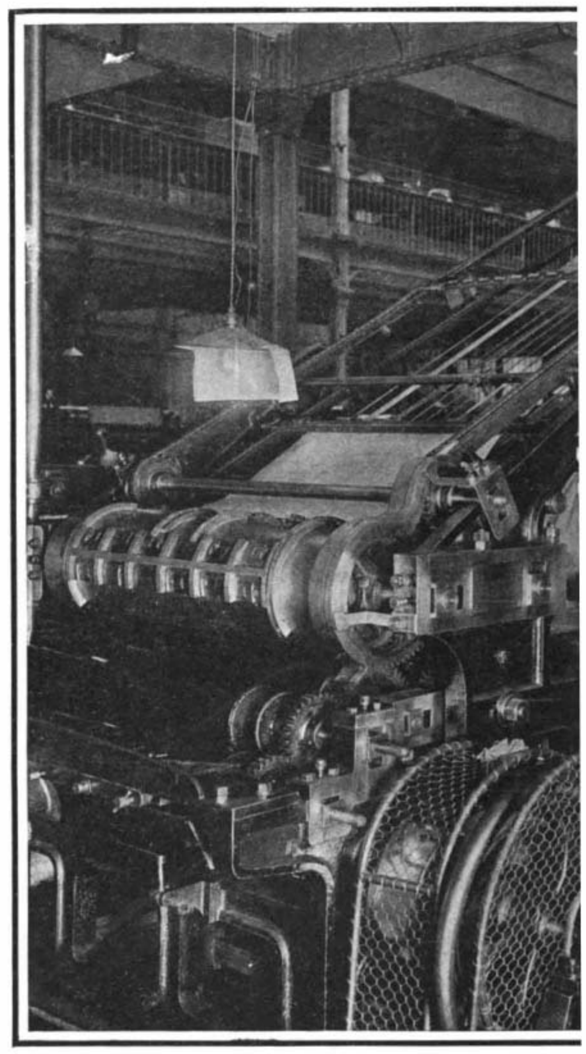


Fig. 7.—Machine for gumming a

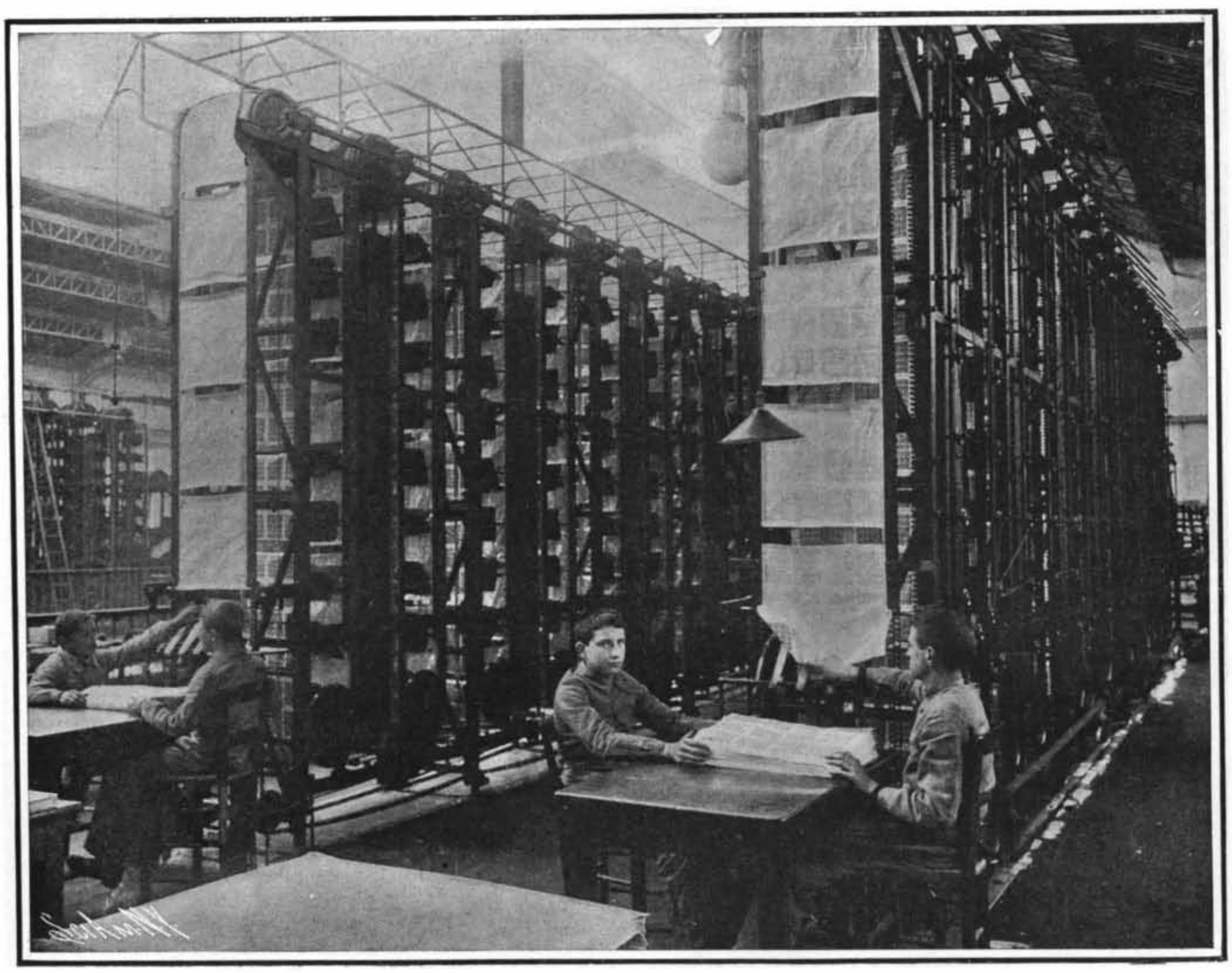


Fig. 2.—The drying apparatus.

Fig. 4.—Making up books of money orders from

Fig. 5.—Engraving the plates from which posta

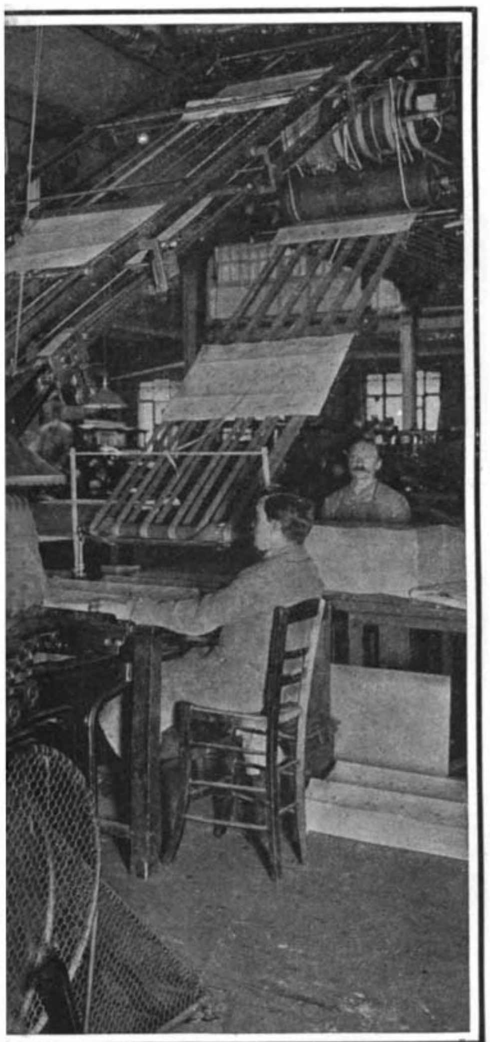
THE MANUFACTURE OF FRE

ands of canvas moving within reach of a man who iles the envelopes on a table. The stamped wrap-)ers are made more easily. After printing they are ut out by a cutting wheel, arranged on tables, ummed with a brush operated by hand, and placed n racks to dry. The letter card department requires complicated apparatus and long operations. The ards must be printed, cut, folded, gummed and per- orated. The perforation is for the purpose of facili- ating the opening of the cards after they have been ealed. The folding is done with a small machine perated by a boy, who lays each card on a plate, over slit, into which the card is forced by the descent of dull knife moved by a treadle. In this way one boy an fold from 4,000 to 10,000 letter sheets in eight hours. The gumming is done in the same way as in the case of the envelopes. The operator in charge of the perforater has nothing to do but to present the folded card to the teeth of the machine.

Postal cards are printed on flat presses from copper plates and are then cut out with a wheel, counted, and packed.

It should be observed that with a selected but very small force of workers, whose daily wages are about 40 cents for boys, 65 cents to $1.05 for women, and $2 at most for men, the government manufactures postage stamps at the extremely low cost of about 20 centimes or 4 cents per thousand; thus the 10-centime stamp sells for 500 times its actual value. These are advantages that are scarcely found to-day in the most prosperous manufactories, but they serve to support a vast administration which extends its ramifications to the smallest villages of France, and when it is recalled that the annual receipts of the French postal telegraph and telephone services amount to about 300 million francs or $60,000,000, it must be admitted that this money is employed to good purpose.

It seems that bacteria of different species can be separated by employing what may be termed "bait." Thus, bacteria concerned in the process of putrefaction may be attracted or separated from the rest by offering them oxygen. Many organisms are allured by the salts of potassium, while others find asparagin or the sap or juice of raw potatoes irresistible.



nd drying letter cards.

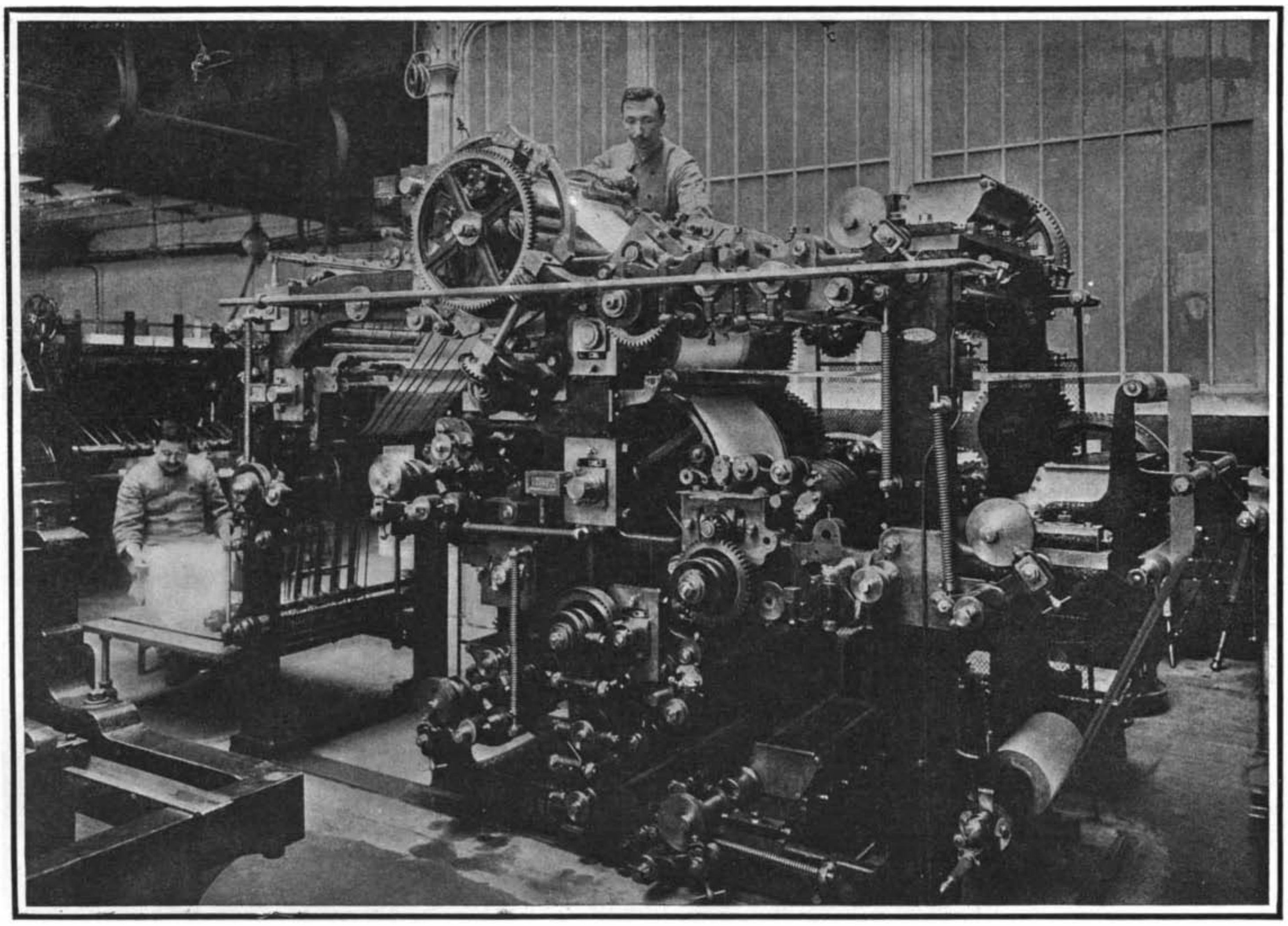


Fig. 8.—Printing money orders on the Marinoni cylinder press.

the revolving table.

re stamps are printed.

Fig. 6.—The perforating machines.

NCH POSTAGE STAMPS.