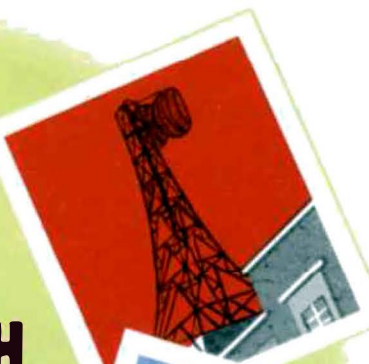




# OUR TELEGRAPH AND TELEPHONE SERVICES

*by*  
*Mary F. Moore*



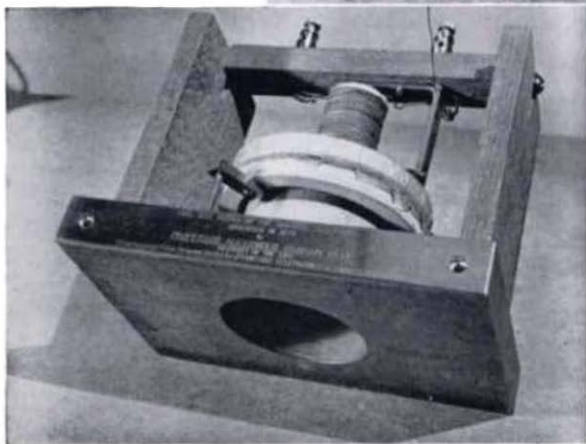
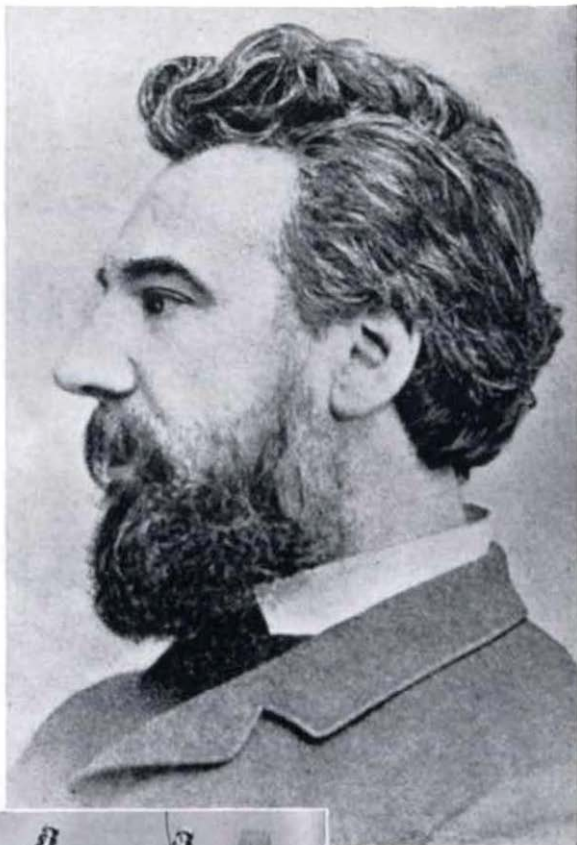


OUR TELEGRAPH  
AND  
TELEPHONE SERVICES

*by*

MARY F. MOORE, B.A.

*Alexander  
Graham Bell*



*A copy of  
Graham Bell's  
first telephone*

# CONTENTS

---

1	Telegraph Poles and Telegraphs	5
2	Teleprinters and Telex	13
3	Telephones, Wires and Cables	19
4	Manual Exchanges	26
5	Automatic and Trunk Exchanges	33
6	Telephone Training School	43
7	More about Training, and the Future	49



*A Post Office lineman at work*

# OUR TELEGRAPH AND TELEPHONE SERVICES

## *Chapter 1*

### **Telegraph Poles and Telegraphs**

"That kid's lost again," said John Hammond to his sister. "I'm sure I wasn't such a nuisance at seven years old."

"You were far worse," answered Susan. "I remember you quite well three years ago, although I *am* a year younger than you."

She looked back down the road and said, "There he is, with his mouth open, watching a man working on top of a telegraph pole."

"Silly goat—he would be!" exclaimed John. Turning round, he shouted, "Paul, stop fly catching, and come on."

His small brother took no notice until there was a second shout. Then he answered, "I'm staying here until this man comes down. I want to talk to him."

When Paul had made up his mind it was no use arguing, and so the others resumed their walk. This was to end at the country post office, opposite the house where they were staying for their summer holiday in Idfield. They had a special appointment with the sub-postmaster there, and John called to remind Paul of it before he set off again.

This time Paul didn't answer, but went on staring at the man on top of the telegraph pole, and wishing he were there too.

At last, the man stepped down the brackets attached to the pole, and then down the ladder beneath.

"Well?" he said, looking at the small boy.

"Please, why are those steps too high for me to climb up and talk to you?" asked Paul.

"That's why—so that you can't," replied the man. "Otherwise we'd have all the kids of the countryside racing up and down. Those steps, or brackets, are for linemen, such as me, to reach by ladders, and do repair work—and for them only."

"That's a pity," answered Paul. "I'd like to sit on top of a telegraph pole—though I wouldn't like to fall off."

"No, we don't make that a habit," answered the man, whose name was Tom Rogers. "That's why I had a safety belt round me and round the telegraph pole just now, so that I could work properly without any danger of falling."

He went on, "Telegraph poles are rather interesting things. Would you like to hear about them?"

"Oh, yes, please," cried Paul. "Then I must hurry on to Idfield, or the others will kick up a fuss."

"That's all right, I'm going there, too, so we can talk on the way," said Tom. "Come along."

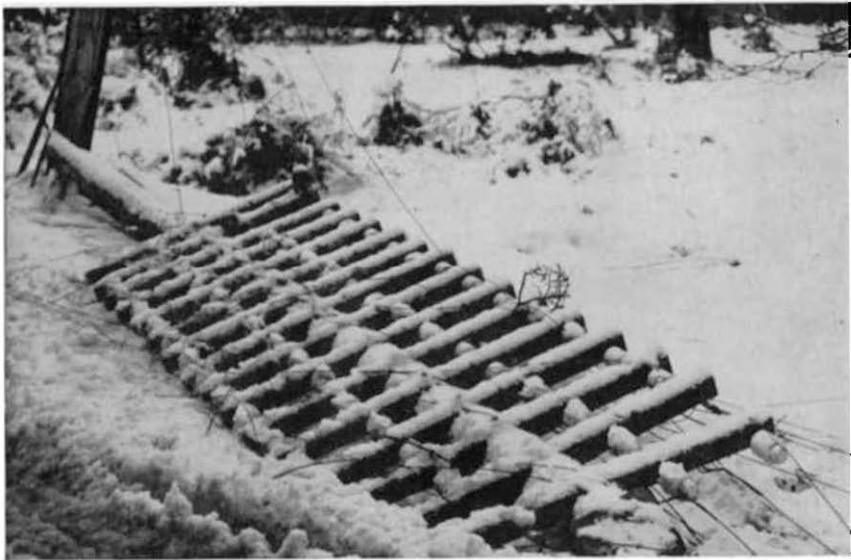
He began, "From the start of the telegraph system, there have been poles and overhead wires. And the poles have been made of extra strong wood, so that they could stand up to bad weather conditions."

"What kinds of wood?" Paul asked.

"Spruce, larch, and pine, some grown in England, and some from abroad. Very strong wood is needed in exposed, hilly country, where the wind sweeps across with a whoosh. The poles there are near together, because then they can give more support to the wires."

Paul gave a skip, and pointing to the pole they were passing at the moment, he asked, "Do those things stop the poles from falling?"





*A telegraph pole damaged by a snow-storm  
(Courtesy Southern Newspapers Ltd)*

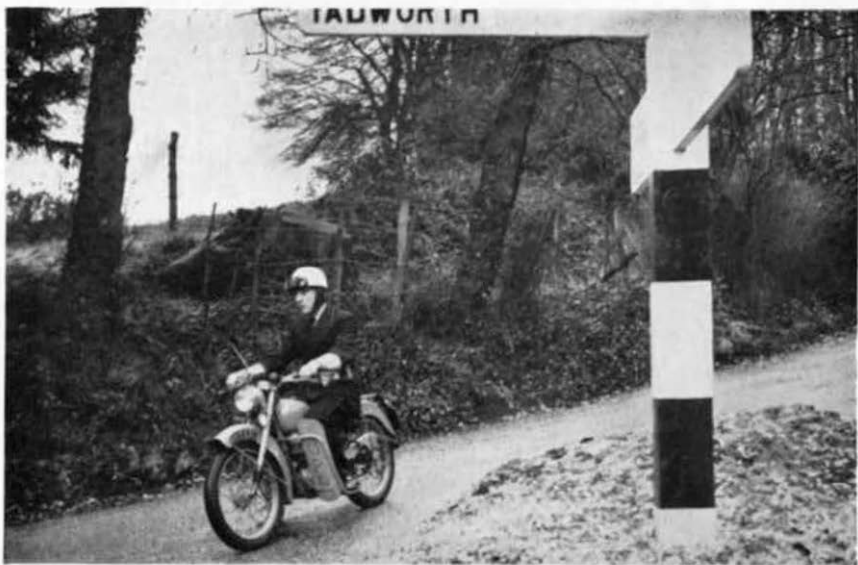
"You mean the timber struts or wire stays at the sides? Yes, my lad, they do. And in a stormy Cotswold winter the poles need every support they can get."

"I can't imagine storms here," Paul told him. "It's so warm and sunny now."

"You should have been here a few years ago then," said Tom. "The snow and ice on the wires dragged them almost to the ground, and some telephones were out of action for days."

He went on, "It's partly because of the weather that instead of having so many telegraph poles with overhead wires we now use cables to carry the wires underground. They are out of the way of storms there, and so underground routes are being used more and more for both telegraph and telephone cables."

"Good, I'll be able to tell John about that," said Paul. "He's my brother, and we're all going to Idfield Post Office



*A young postman motor-cyclist on telegraph delivery*

now because he wants to find someone who'll answer questions about telegraphs and telephones. Mr. Rayne, the postmaster, says he knows a man."

He added, "Perhaps I'd better hurry!" and tried to match the big strides Tom Rogers was taking along the road. But the others had been there some time when he slid quietly into the Post Office, hoping to look as if he had been with them all the time.

John and Susan hardly noticed their small brother, however. They had arrived at exactly the right moment to find a young man chatting with Mr. Rayne.

"Now, John, see how I've kept my promise to you," said the smiling sub-postmaster. "I said before your holiday was over I'd find someone to explain about telegraphs and telephones. Well, here he is. This is Bob Cole, a Post Office engineer."

"That's super!" cried John, shaking hands with Bob, and then perching beside him on the counter.

Susan nodded to the young man before crossing to the other side of the room, which was the shop part, stocked with almost everything from needles and pins and books to potatoes and apples. But she kept one ear open, so that she could listen to anything interesting.

"'Telegraph'," said Bob. "Do you know what the definition of that is?"

"No, please tell me," begged John.

"'An apparatus for transmitting information over a distance'," quoted Bob. "That sounds dry, but the history of the telegraph is anything but dry. I can tell you we owe a great deal to those people of last century who made communication so much easier for us."

"But didn't people send messages somehow before the telegraph was invented?" John wanted to know.

"Yes, of course. In far-off days men used fire, smoke, bells and even trumpets and guns to get into touch with each other. Very early in history British ships used flags, and later there was signalling by sound and semaphore. But it was not until the nineteenth century that scientists discovered how to overcome time and distance so well that people in widely separated places could exchange messages."

"Which came first, the telegraph or the telephone?" John asked.

"Oh, the telegraph," answered Bob. "They have much in common, of course, but the telegraph was invented first, not long after railways started running. In fact, the first electric telegraph signalled the arrival and departure of trains from one station to the next."

"Good gracious. I should never have thought the railways had anything to do with telegraphs," said Susan, coming back suddenly.

"But they had, quite a lot, and the telegraph grew in importance as quickly as the railways. You see, people began to realise it could be useful for sending private messages, too, and they insisted on doing this, in spite of the authorities."

"Who owned the telegraphs?" asked John.

"At first private companies and the railways. Sometimes the private companies didn't give a very wide service. They found it profitable to concentrate on the towns with most traffic, and that meant some places had no telegraph service at all. When this happened people got very annoyed, and finally it was suggested that the Government should take over the telegraph service."

"And did it?" asked Susan.

"Yes, but two Acts of Parliament were needed to settle the matter—one in 1868 and the other a year later. After that, the Postmaster General had the sole right to convey the telegraphic messages which started buzzing between about one thousand post offices and two thousand railway stations."

"But why railway stations?" asked Susan.

"Because they were agents for the Post Office—and still are," Bob explained. "You can still send a telegram from most large railway stations. In the end, under Post Office management, the telegraph became very popular because it was a fairly cheap way of passing on news quickly. It soon became so common to telegraph that people have been known to send a telegram asking for a clean pocket handkerchief. In those early days, about 1890, it cost 6d. for twelve words, but like everything else it costs much more now."

He continued, "Well, that's the beginning of the telegraph service, and, of course, things have gone much further since then. Today, for example, both the telegraph and telephone services can use underground routes and automatic equipment and that helps to speed things up very much."

Charges to pay \_\_\_\_\_  
 RECEIVED \_\_\_\_\_

POST OFFICE  
**TELEGRAM**  
 Prices. These handed in, Office of Origin and Service ~~Words~~ Words.

No. \_\_\_\_\_  
 OFFICE STAMP  
 BERKHAMPTON  
 12 MAR  
 DES.

At 9.40  
 From 11.15 a.m.  
 By 10

13 9.24 CHELTENHAM T 15

At \_\_\_\_\_ m  
 To \_\_\_\_\_  
 By \_\_\_\_\_

SMITH 79 EAST HILL LONDON NW5 -

ARRIVING PADDINGTON STATION WITH JILL 3 PM  
 TOMORROW - JACK +

79 NW5 3 PM +

For the repetition of doubtful words telephone "TELEGRAMS ENQUIRY" or call, with this form at office of delivery. Other enquiries should be accompanied by this form, and, if possible, the envelope. B or C

*A telegram*



*A telegraph instrument of 1840*



*Sending messages by Telex*

## *Chapter 2*

### **Teleprinters and Telex**

Just at that point, Paul slipped in, and hearing Bob he whispered to himself "My man said wires and cables took underground routes. I expect that's what he means now."

"The sending of telegrams has been speeded up," Bob went on, "especially those going by 'phone. By the way, you'll be interested to know what the word 'telegram' means. Hold your breath, and listen.

"The Post Office Guide says a telegram is any communication that goes over the telegraph, and that the word telegraph itself means a wire or wires used for the purpose of telegraphic communication."

Susan pulled a face. "Sounds a bit dry," she said.

"The rest of the definition isn't quite so bad. It says the word telegram also means spoken telephone messages—and even signals by bells—think of that! It includes messages by wireless telegraphy, too."

"It seems to mean a lot of things," piped up Paul. "Are you going to tell John about telephones, too? I like those."

"Yes, but other things come first," said Bob. "And you'll all be tied into knots if you hear about everything at once."

He explained, "As many telegrams as possible are read over the 'phone from the nearest office. But quite a lot have to be delivered by messengers, and that makes it expensive."

"Why?" asked John, immediately thinking of the boys who rode the bright red motor cycles, and wishing he could be one of them.

"Because delivery by messenger takes more time and money. Nowadays it's cheaper, and often more convenient, to 'phone than to send a telegram, and so telegrams aren't nearly as popular as they used to be. But for some things people still generally send telegrams. Can you guess what they are?"

Susan looked puzzled, and John scratched his head. But Paul, without meaning to, gave the right answer. "Grandma sent Daddy a telegram on his last birthday," he said.

"That's it," laughed Bob. "People send Greetings Telegrams for birthdays, weddings, and so on—millions of them every year. And they often telegraph special news, good or bad. So although there aren't nearly so many telegrams sent as there used to be, quite a large number still fly about the country."

Bob looked at his watch, and said, "There are two other things connected with the telegraph service that I ought to tell you about. I shall just have time before lunch."

"What are they?" demanded Susan.

"Teleprinters and Telex," answered Bob. And to that Susan answered, "I don't suppose even John has heard of them! Do go on, please."

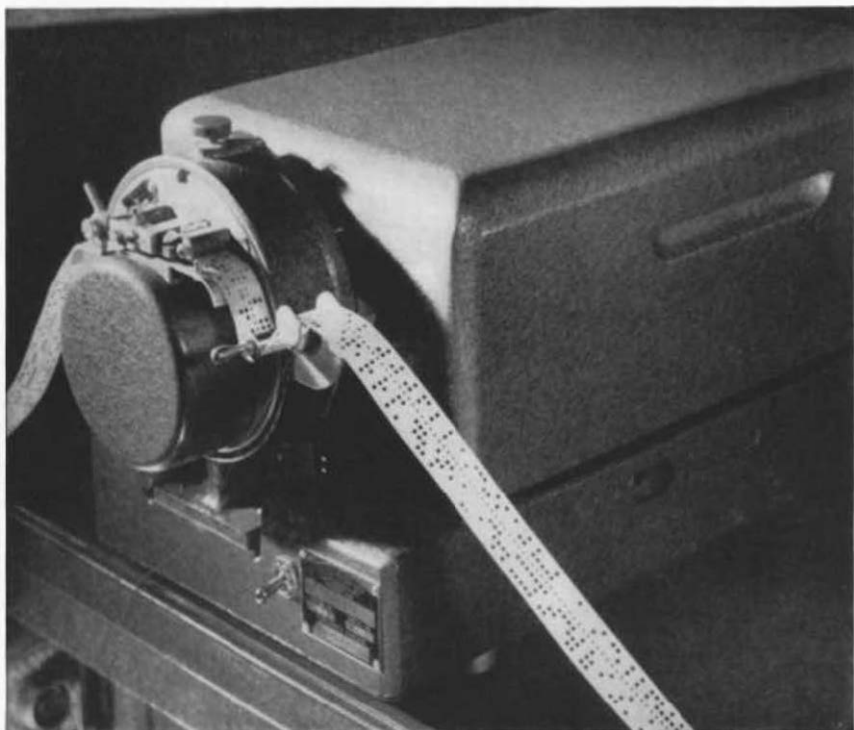
"Well, in the early days of telegraphy an operator receiving a message either watched a needle, which moved by electricity and pointed to the various letters, or else he listened to signals in Morse code. Then he wrote down his messages. But now an operator sending a message uses a teleprinter, which is an instrument with a keyboard very like a typewriter's. He types the message and at the same time it is also printed on another teleprinter at another telegraph office, perhaps hundreds of miles away."

"Did you say hundreds of miles?" Paul asked, dancing with excitement.

"Yes, lad, I did. Why?"

"Because I knew there was magic about the Post Office, and this must be part of it," declared the small boy.





*This machine reads the code on the tape and sends the message automatically at high speed*

"You talk too much of things you know nothing about." reproved his brother. "Please go on, Bob."

"In the telegraph office at the other end, the message is printed on paper tape. This is then gummied to a telegram form, and delivered more quickly than was ever possible before teleprinters were invented."

"Does that mean they're used a lot now?" asked Susan.

"Yes, most inland messages are sent that way," Bob told her. "We get a great deal of help from some apparatus, as we call it, which makes it possible for thirty-six telegrams to be sent at the same time on the same electric current circuit. Now, I'll explain about Telex."

Just then, John picked up a red book, and began to hunt through its pages.

"If you're thinking of what the Post Office Guide tells us about Telex, you'll find it on the back inside cover," Bob advised him.

"Oh, yes," answered the boy. "It says here that 'G.P.O. Telex service gives the speed of the telephone with the authority of the printed word'."

"That describes it splendidly," declared Bob. "Through the Telex service, customers can exchange their own printed messages. Each customer has a teleprinter, and when he is in touch with the office of the people he wants, he types, or teleprints, the message, and the machine at the other end receives and prints it too, at the same time."

"Does there have to be someone there?" Susan asked.

"No. Not if the electric current is switched on. The message will still come through all right if it is, but you must remember to leave enough paper on the machine, of course. Six copies can be made at the same time by each teleprinter."

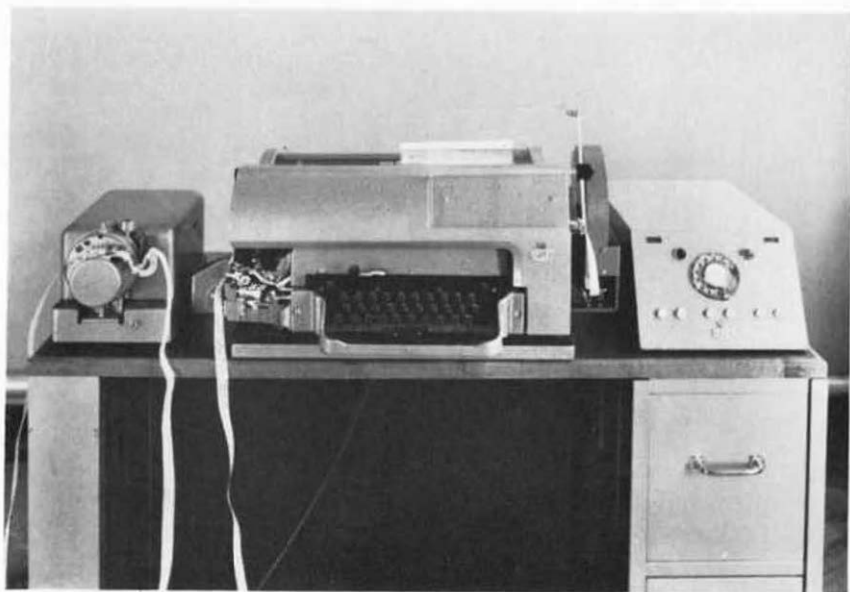
"I should say that must be very useful for business people," said John thoughtfully.

"It is, and a great many people have started to use the Telex service during the past few years. It puts them into touch with other users, not only in this country but all over the world. And the service goes on day and night."

"Do you mean that if I had a business and had Telex, and left the machine switched on all night, I might find a message waiting for me next morning?" asked John wonderingly.

"I do. It would be already typed, even though no one was there," Bob assured him.

Then he heard Paul whisper, "Magic, magic, magic!" and agreed, "You're quite right, it is! But now I want my lunch, and there's no magic in that. I'll be seeing you again!"



*A Telex machine in a customer's office*



*Fleet Building: the new home of the London Telex Exchange*



*Joining up a big cable*

## *Chapter 3*

### **Telephones, Wires and Cables**

As they crossed the road to the house where they were staying, Susan said, "I wonder what Bob meant by, 'I'll be seeing you again'?"

"He was meaning me, of course," John answered teasingly. "Mr. Rayne told him I wanted to know about telegraphs and telephones, and we haven't started on the 'phones yet."

But when Bob turned up unexpectedly that evening, and Mrs. Barrow (their landlady) opened the door, they heard him ask, "May I see the three Post Office enthusiasts, please?"

"That's me, too!" shouted Paul, and bounced out before the others could stop him.

"Have you come to tell us some more?" he demanded.

"Yes, and if you'll all come for a walk with me, I'll talk as we go along," said Bob.

The other two were there almost before he had finished speaking.

"It's telephones this time," Bob said. "They're very important. They carry a large and growing part of the business of the Post Office, while the telegraph traffic is shrinking and has been run at a loss for some time."

"Why's that?" asked John.

"Well, if you think of it, telephones are much more convenient. You'd never think of sending a telegram when you could make a telephone call instead, now would you?"

"No. You'd have to wait for an answer if you did," said Susan wisely.

"True enough," said Bob. "So you can see that, as more people get telephones, the number of telegrams gets smaller."

"Yes, I see," said Susan. "Who invented the telephone, Mr. Cole?"

"Dr. Alexander Graham Bell, who became very famous. That was in 1876, and the first spoken message went to his assistant in another room."

"What did he say?" asked Paul. "Was it something exciting?"

"His assistant thought so, for when he heard the doctor say, 'Mr. Watson, come here, I want you', he went at once."

"Dr. Graham Bell was a Scotsman, who had gone to live in Canada, and had studied electricity and magnetism carefully. After his invention of the telephone, he prophesied that some day cable for it would be 'laid underground or suspended overhead'. Was he right?"

"I should say so!" exclaimed John.

Bob nodded, and agreed, "He was, and when people in England heard of his invention they were very interested."

He took a photograph carefully from an envelope, and showed it to them. "This is what Graham Bell's first telephone looked like," he said. "He brought it to Great Britain a year after his discovery."

Three interested heads bent over the photograph, and John, Susan and Paul remarked:—

"Why, it's not a bit like a telephone!"

"It looks like a toy!" and

"What's the bobbin thing for?"

Their friend laughed and said, "I can't explain it all in a minute, so that you could understand. But that was certainly the first telephone, and a year or two later Graham Bell visited Queen Victoria in the Isle of Wight, and showed her how it worked."

"After that, both the Post Office and private companies



*Cables coming into a big telephone exchange*

took an interest in the telephone. Soon there were lines connecting the main towns in the country with London, and by 1891 London could speak to Paris over the 'phone."

"Did a lot of people have 'phones?" asked Susan.

"Not very many, but there were more telephones in London than in the whole of France," Bob told her. "Later, the various companies formed themselves into the National Telephone Company, but in 1912 the General Post Office bought up most of the private telephone services, and now the Postmaster General has the sole right to provide the telephone service in the United Kingdom."

"Are there no private companies left?" asked John.

"Not private companies," Bob answered, "but Hull Corporation still runs its own service with permission from the Post Office. When the Postmaster General was granted the monopoly in 1912, several towns were allowed to continue



*Fixing telephone wires to a customer's house*

their own arrangements, but gradually these have stopped until only Hull is left. The Channel Islands also have their own arrangements, by the way. Now, I'll explain a bit more, and when I'm sure you understand we can do something exciting together."

"What is it?" they asked curiously.

"Wait and see," commanded Bob. He went on, "I daresay you know that there are both public and private telephones. Anyone can use public 'phones, say from a post office or from a kiosk in the street, but private telephones are rented to customers by the Post Office."

"How much do they have to pay?" Paul was beginning to ask, but the others "shushed" him. So Bob continued, "Every telephone is fitted with a mouthpiece, which holds a microphone, and with an earpiece which holds a receiver."

"The one you showed us a picture of wasn't like that," interrupted Paul.



"No, Graham Bell's wasn't, but that was a very long time ago," said Bob. "Nowadays, the microphone and receiver are separate, but in one holder, for convenience. We call it the 'hand-set'. The first telephone used the same parts for sending and receiving. When the telephone is not in use, the hand-set is placed on its rest, and the electrical circuit that connects it with the exchange is disconnected by the weight. Do you understand that?"

"I do," declared Paul.

"You would!" said John squashingly. "But I hope we all do."

"Good. Well the next bit may not be too easy to understand, so hold tight, and ask me questions if I go too fast," Bob said.

"When one telephone customer wants to speak to another, he gets into touch with the local telephone exchange, by means of a pair of thin wires kept specially for him. Those wires run all the way from his own telephone to the exchange."

"Do they go over telephone poles?" Paul asked with interest.

"Some of them do. They may go out of a house to a bracket high up on an outside wall, and from there to the top of what is called a 'distribution pole' which takes several pairs of wires from different houses. From there they run down the pole in a cable to an underground jointing box. Or they may go from the house through an underground pipe straight to a 'distribution box' in the pavement near by. Got that?"

John and Susan nodded, and Paul said hopefully, "I might get it if I think a bit."

"I'll help you with it later, kid," John promised his brother. He was really very fond of Paul, although he thought he needed frequent squashing.

"Good lad," approved Bob. He went on, "As I say, wires may be taken overhead to a distribution pole, or underground

to a distribution box. In each case they meet other pairs of wires belonging to other customers. Together these bunches of wires become 'distribution' cables, which end up in junction boxes somewhere down the road. There they meet other similar cables, to make still larger cables, which run right on to the telephone exchange. Got it?"

Again they said they thought so, and Bob commented, "I hope you have. Then when you see the men with the big green Post Office vans you'll know they're probably working on cables. Maybe they're connecting a cable, with all its wires, to the exchange, so that new customers can ring up their friends."

"But why must we have telephone exchanges?" asked Susan. "Couldn't the customers telephone each other without them?"

"Can you imagine how many thousands and thousands of wires it would need for every customer in the country to be linked up with every other customer?" demanded Bob.

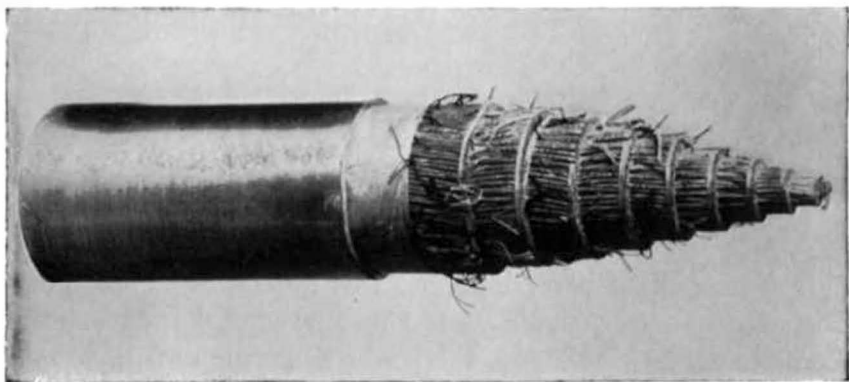
They laughed, and Susan said, "Yes, I see that was a daft question."

"Oh, no, you've got to learn," said Bob comfortingly. "Let's get this clear—I'll go over it again. It would be too costly, and quite impossible, for each customer to be connected directly to all the rest. So all customers in the same area are connected to a service centre, which we call a telephone exchange.

"Each customer has two wires running to the exchange, which start their journey as a single pair and finish up at the exchange as a single pair in a large cable with as many as a thousand pairs in it. Now I'll add a bit more to that.

"Every exchange is connected with other exchanges by more cables so that calls can be made between exchanges all over the country."

He paused, and then told them, "An exchange has switches



*A piece of trunk cable*

that can link up any two pairs of wires coming into it. It also has wires to other exchanges nearby, and can link up with trunk exchanges all over the country."

Paul shook his head, and said sadly, "I don't understand about 'trunks' and 'exchanges' properly yet. Shall I ever?"

"Of course you will," Bob told him. "Wait till I've finished with you. It takes a long time to learn about telephones and exchanges—but not quite so long as to build an exchange!"

"How long's that?" asked John.

It was the question Bob expected, and he answered, "Exchanges are designed in the first place to last for twenty years, and it takes about four years to plan and build a big one. Later on, of course, they are made bigger, or altered, if necessary."

"Are all exchanges big?" questioned Susan.

"By no means. Some are very tiny country ones, with only a few customers. And exchanges may be either manual or automatic."

"What on earth does that mean?" asked the girl.

"You'll soon find out. I'm going to show you both kinds," Bob answered unexpectedly.

"Not really!" they cried in delight.

## *Chapter 4*

### **Manual Exchanges**

Bob steered the party back towards Idfield, as he answered with a grin, "Yes, that's what I meant when I spoke about 'something exciting'. But I'd better tell you the difference between a manual and an automatic exchange—unless you know already."

"I know a bit about it," answered John slowly. "Isn't a manual exchange one where you ask the operator for a number, and an automatic exchange one where you can get it for yourself?"

"That's right," their friend agreed. "The manual exchange was invented long before the automatic exchange. America gave us the idea for the automatic exchange, and the first one in Great Britain was opened in 1912. Most exchanges are now automatic and the rest will be altered as quickly as possible, though it will take some time to finish the job.

"Manual exchanges are still important, though," he added, "and as that's what I hope to show you first, I'll tell you what happens when a call is made on one.

"Now, Mr. John, you're going to telephone to Miss Susan, who lives in another part of your town. When you take your telephone from its rest a little lamp glows on the switchboard in front of the operator at the telephone exchange, and above your telephone number—let's make that 'Stonely 1279'.

"The operator takes up one of two plugs attached to cords, and puts it into a hole, or jack, under the calling lamp. Then she moves a switch, which we call 'throwing a key'. 'Number, please', she says to Mr. John. Now, you give his answer."

John paused, and then said, "Stonely, double one, two six, please."

"Right. The operator now takes the plug attached to the other cord, finds Miss Susan's number, 1126, on the switchboard, and gets ready to plug into that hole. When you see the switchboard, you'll notice that she has thousands of holes to choose from, and I want you to notice particularly how it is made easy for her to find the right one. The holes are arranged in patches of one hundred, and the eleven hundred group is at the bottom left-hand corner—that is, one up and one in.

"I want you to remember the words 'one up and one in', because it will make it much easier for you to understand how an automatic exchange works when we come to it.

"Having found the block of holes with numbers from 1100 to 1199, the operator has to find 26 to get the number you want. What does she do? I'm sure you can guess. Two up and six in, and in goes the plug."

"But what happens if someone else is already 'phoning to Susan?" asked John.

"The operator hears a little click just as the tip of the plug touches the edge of the hole. Then instead of plugging in she tells Mr. John, 'I'm sorry, the number's engaged'."

"Then Mr. John will ring off, but try again in about ten minutes," suggested Susan brightly.

"That's right, and by then the line will be free, I expect, and the operator will push the second plug right into the jack, and connect Mr. John and Miss Susan."

"Can the operator listen to what we're saying?" John asked.

"She can, but she doesn't," Bob told him. "After getting the connection she switches a key to disconnect her from the conversation—don't forget she has lots of other calls to deal with. She listens only when she wants to make sure that everything is all right.

"When the conversation is finished, and the telephones are



Susan dials  
the exchange  
and asks for  
the number.

# Susan m

BRACKET AND INSULATORS



Her voice goes .....

EXCHANGE APPARATUS



to the exchange.

EXCHANGE SWITCHBOARD



The operator .....

DISTANT EXCHANGE



at least one more big exchange

OVERHEAD POLE ROUTE



.. more wires, and perhaps ....



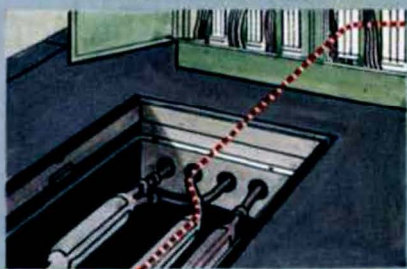
# makes a Trunk Call

DISTRIBUTION POLE



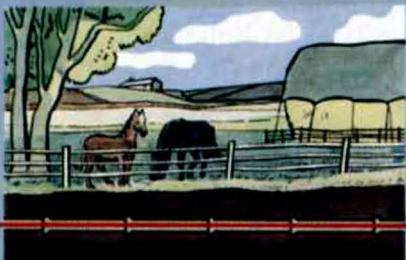
over wires .....

FOOTWAY BOX AND CABINET



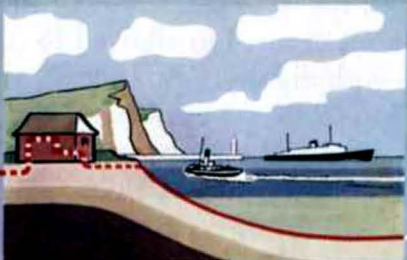
and along cables .....

UNDERGROUND CABLE IN DUCT



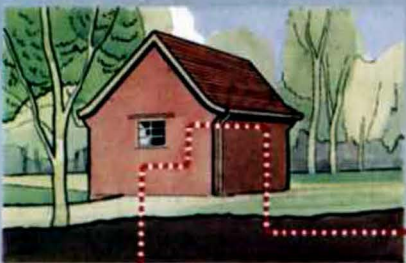
connects the call .....

UNDERWATER CABLE ON SEA BED



through more cables .....

UNATTENDED AUTOMATIC EXCHANGE



a small country exchange...

and Susan  
talks to Granny  
three hundred  
miles away.



put back on their rests, two other little lamps near the cords light up, telling the operator the call is over. She presses a key which charges the call to the first customer—in our case Mr. John—then she takes out the two plugs, which drop back to their resting places ready for another call.”

“It’s a bit hard to follow all that,” said Paul, rumpling his hair.

“You’ll understand better when you’ve seen a switchboard,” Bob assured him.

“But what happens when Mr. John wants to speak to someone not on the same exchange?” asked that gentleman.

“Oh, that’s a bit different. Then the operator has to ring up another exchange, in the same way, and get the call put through. I’ll be telling you about that later, when we’re dealing with trunk calls,” said Bob. “And now we’d better hurry a bit. It’s late for this young chap to be up.”

“If you mean me, I’m allowed to stay up later on holiday,” said Paul with dignity. “And please, you haven’t told us when we’re going to see the exchanges.”

“Well, I thought tomorrow morning would be a good time to see a manual one,” said Bob. “This village has a very tiny exchange, which works by itself—it’s what we call an Unattended Automatic Exchange, or UAX. It has no staff working there, but from time to time an engineer calls to do repairs. But we have a manual exchange at Shellford, and I thought you might see that. It’s nearly five miles away on the bus route. Of course, first I must ask your parents’ permission to take you.”

“They won’t mind,” said Paul. “They’ll know you’re a nice man.”

“Thank you very much,” he replied with a laugh.

Paul happened to be right that time, and so the three were off with Bob again the next morning and were soon at the telephone exchange at Shellford.





*Operators at a telephone switchboard*

The Officer-in-Charge, Mrs. Moffat, took a great interest in her visitors, and answered more questions than she could count. There were about half a dozen girls working on the switchboards that received the calls, and they sat on high swivel chairs, so that they could swing round and reach to put plugs in—just as Bob had described them doing. Little lights flickered on and off all the time, and Susan felt awed at the quickness of the girls in answering calls.

"I'd never be able to do that," she said to a pretty dark girl, who had just taken off the earphones through which she received calls. "I'd be fumbling all over for numbers."

"Oh, you wouldn't if you'd been properly trained," she answered, "You'd get used to it."

"Perhaps," answered Susan doubtfully. "But, anyway, when I do 'phone in future I shall always try to be polite to operators. They're so clever."

"Thank you," said the girl, answering for all operators. "But, you know, people are really very nice, and they often compliment us when they are pleased with the service. We feel we get to know our customers as friends."

All three were so interested in the work that the morning raced away. Suddenly, Bob asked, "What time are you kids supposed to have dinner?"

"One o'clock," replied Susan.

"And it's half-past one now," added John. "My, there will be a row!"

But between them Bob and the operators saved them from trouble.

"It's a pity we're so late," said Bob. "I have to visit an automatic exchange this afternoon at Tewney, and I wanted to take you. But there's not time for you to go home and back—I've got my cats with me."

In a minute, Mrs. Moffat came forward with a smile. "My girls have just suggested that if we all pool our dinners we can feed our three visitors, too," she said. "It won't be a big meal, but it will keep them from starving!"

"Oh, you are kind!" exclaimed Susan. "Thank you very much."

"But we'd better 'phone your people first," declared Bob. "Mrs. Barrow's on the 'phone."

So they were able to watch a call that concerned them especially go through from the exchange. And then they went into the small room where members of the staff ate their meals, and settled down to sandwiches, biscuits, and tea, finishing up with chocolate.

"I feel as if I belonged to the Post Office now," declared Paul. "Perhaps I will some day, if I haven't gone off to another world in a space ship."

## *Chapter 5*

### **Automatic and Trunk Exchanges**

The three visitors were enjoying themselves very much when Bob warned them, "Our bus is due in about five minutes, and if I know Jim, the driver, he won't wait a second!"

At that, they all sprang up, thanked the telephone people politely once more, and bounced out into the road. They were only just in time.

As the bus hurried along on its six mile journey to Tewney, Bob said, "I'd better tell you about an automatic telephone exchange. You won't find many people there, and it's not friendly like a manual exchange. But it's almost uncannily clever, and I'm sure Paul will find his magic there."

"Oh," he rejoiced, bouncing about on his seat, "then I shall love it!"

"With an automatic exchange the customer doesn't need an operator to connect him with other customers on the same exchange, but can get the numbers for himself," went on Bob. "His telephone is just the same, except that it has what we call a 'dial' attached. Here's a picture of one," and he pulled an illustrated booklet out of his pocket.

"You'll notice the dial is a circle, and through ten holes round the edge of the circle you can see figures, one, two, three, and so on up to nine, and then 0. In some of the big cities there are letters as well as figures on the dial—we're beginning to fit them everywhere—but here we use only figures at present. The plate with the figures printed on it is fixed but you can put your finger into any of the holes, and move the dial clockwise, until it comes to a stop at the bottom."

"And do you have to dial every figure of the number you want to get?" asked John. "I mean, if it was 2739, first the two, then the seven, then the three, and lastly the nine?"

"Yes, you've got the idea," approved Bob. "And in between the numbers you should take your finger right out of the hole, and let the dial swing back to its normal position. If you try to stop or hurry it you'll probably get a wrong number."

"Suppose I did dial a wrong number by mistake?" queried John.

"Then you'd have to put your receiver down for a few seconds and start all over again."

"Well I just don't see how a machine can find a number instead of an operator doing it," said Susan.

"That's where the magic begins," said Bob. "Do you remember, when I was telling you about the manual exchange, I asked you to keep in mind the words 'one up and one in' when the operator was finding the right hole to put a plug in? Well, the automatic system works on just the same idea. Instead of an operator, we have what we call a 'selector', and when you dial the number you want, this selector counts in just the same way as the operator. As you dial 45, for instance, a magnet in the selector moves an arm carrying what amounts to a plug. It goes up four steps and then round five steps to connect to 45. There could be a number of selectors in use for each call, of course, but together they provide all the parts of the number you are dialling. When all the selectors have done their work, the caller's telephone is connected right through to the telephone with the number that has been dialled."

"Then it is very clever and very magic," Paul declared. "It'll be exciting to see it working."

"Don't people on an automatic exchange ever have anything to do with an operator?" asked John.

"Oh, yes, sometimes they have to ask for the number they



*A modern telephone*

want and then they dial 'o' or '100'—it depends on the district they are in. That happens when they want a trunk call to a place some distance away, or if they're sending a telegram by 'phone, or are having difficulty."

"And suppose I wanted the fire brigade quickly," said John.

"It tells you what to do on the label in the middle of the dial," he replied. "Sometimes the special '999' service is in operation, but this isn't available everywhere. You might have to dial '999' or 'o' or '01', according to the instruction, and ask for the fire brigade—or the police, or the ambulance service if you want them."

As Bob finished speaking the bus stopped, and he said, "Here's Tewney, where we tumble out."

The telephone exchange was not very far down the road. It was surrounded by a neat little garden, and a man was working



*A customer dialling a number*

hard there. "That's old Bill," said Bob. "Since he retired he spends all his days and half his nights in this garden, with good results. The Post Office allows him to make the garden and keep the produce, and in return he keeps the grass cut and the hedges clipped and gets rid of the weeds. Just look at those tomatoes!"

To Susan the gardener seemed the only human thing about the exchange, but to Paul the inside was thrilling. He said, "Good afternoon" politely to an engineer testing some apparatus in the exchange, and he was fascinated by the rattles and whirrs of the selectors, caused by customers dialling their calls, and by watching little lamps flicker on and off. Bob explained that the lamps were signals to help the engineers.

Once more Bob told them about the selectors, and showed how they picked out the numbers dialled by customers. He

said, "If you want a number that has four figures—say 2375—then you'll need three selectors, one for the thousands will give you 2, one for the hundreds 3, and the last for the tens and units 7 and 5."

Paul, with his head on one side, said, "Please explain that again." So Bob obligingly did.

Their afternoon visit was shorter than the morning one, and Susan said she didn't think an automatic exchange was nearly as interesting as a manual one.

"That's because you're a girl, and were talking to girls this morning," said John. "I agree with Paul that this is more interesting."

On the way back from Tewney, Paul asked, "Are you going to show us anything else, Bob?"

The other two told him he was cheeky, but Bob laughed and said they really ought to see something of a trunk exchange. "But not tonight, or you'll be dreaming telephones," he declared. "Let me think if I'll be going near one tomorrow."

In a minute, he promised, "Yes. If I switch my work round I can get to Burham Exchange, and take you there—that is, if your mother and father don't mind. But it's getting near the end of your holiday, and you may want to do something else."

"No," answered John stoutly, "this is all part of the holiday."

The others agreed with him, and Paul said, "I'll be sorry when we come to the end of things you can show us."

"Will you?" asked Bob. "Well, I had thought of one other thing that would interest Susan especially, but I'd have to find something else for you boys."

"You could go on answering questions," suggested John, and Paul chipped in, "John's got a large box of questions inside him, and they're always spilling over."

Bob laughed. "Here we are at Idfield," he said. "I'll ask if you can come with me again tomorrow, and then I must hurry home to a small girl, and an even smaller boy. They



*999 position at an exchange switchboard showing lamp*



*A 999 call might have saved this  
(Courtesy Wallington Studios)*



don't like to go to bed until Daddy is there to help bath them."

Of course it was all right, and so next morning they went to Burham, and were soon inside a telephone exchange much bigger than the other two had been. Susan cried, "Why, it would take a whole day to see everything in just this room!"

"It's not so overpowering as it looks," Bob assured her. "You see, all customers connected to this exchange can dial one another direct, and also people connected to a number of other exchanges in the district. It's chiefly for trunk calls over long distances that operators are needed, plus lots of extra equipment."

"Can an exchange get straight into touch with another anywhere in the country?" asked John wonderingly.

"No, it's not as easy as that. There are lines to connect neighbouring exchanges. These are called 'junction' circuits, and carry calls to places not too far away. With their help the operator can put a customer in touch with another on a different exchange, although many junctions can be brought in by dialling special codes.

"But between towns some distance apart the lines are called 'trunk' circuits, and carry trunk calls. An operator speaking from an exchange on a junction circuit must get in touch with another operator on a trunk circuit before she can put a long distance call through. Can you grasp that?"

"Not quite, but I think I might if I watched a long distance call being made," said John hopefully.

"Right. We'll go along to the switchboard so that you can see and hear what happens," promised Bob.

They moved down the big room which had a long switchboard down each side, very like those they had seen in the manual exchange earlier. The operators were busily "plugging" and "unplugging" cords and making notes of calls. There was a general hum of activity.

The children stood quietly listening to the nearest operator. Several lights were lit on the board in front of her, showing that customers were ringing for attention. The operator plugged into the hole beneath one of the lights and said, "Number, please." After a slight pause she said, "Vincent 9851. Hold the line, please."

"That's a London number," said Bob quietly to the children. "Watch carefully. This exchange has a direct trunk route to London. The operator can plug in and dial the number direct."

They watched, and sure enough the operator plugged a second cord into another hole and dialled V-I-N 9-8-5-1.

"Hold the line, please, your number is ringing," said the operator to the caller, and shortly after that—"You're through."

"I think I see it now," said John. "If this weren't a trunk exchange, the operator couldn't have plugged straight through to London. She would have called the nearest trunk exchange and got them to do it for her."

"That's the idea," said Bob. "We'll be engaging you as a telephone operator soon."

After that, they walked round the room, speaking to friendly operators, who smiled at them and answered many questions. They jumped when they heard a buzzer and saw a quite large red lamp which lit up on top of the switchboard. Bob told them a customer had dialled "999" and wanted the fire brigade, an ambulance or the police, and that such an emergency call must always be answered at once.

Then they crossed over to the Enquiries position, where all sorts of puzzling questions had to be solved, mostly from people who wanted to know the 'phone number of somebody connected to some other exchange.

Suddenly, John asked an operator, "Do you ever get people ringing up just to tease you?"

"We do," she answered fiercely. "We call those 'malicious' calls. They are often made by boys who think it will be fun to

stop on the way home from school and get us to send the fire engine to some place where there is no fire at all.

"That isn't a joke," she went on. "It gives everyone a lot more work, and if a real fire should break out, the same fire engine might not be able to get there in time."

"Can you catch anyone who does that?" John wanted to know.

"Yes. We can get the police to a telephone kiosk very quickly to capture the culprits. Then they have to visit the police court, and explain why they've been so silly," said the girl.

The Burham exchange was so fascinating to them that Bob said he wished he could leave them there all day. But he had something else to do that afternoon, so they were dragged off for a bus to get them back to Idfield in time for lunch.

"I like the trunk exchange better than the automatic exchange," said Susan, "but not quite so much as the manual one."

"Well I think all exchanges are interesting," declared John.

"So do I," squeaked Paul. "Please, Bob, what's the other thing you said Susan would like and we shouldn't?"



*A small automatic telephone exchange*



*New telephonists handling their first telephone calls*

## *Chapter 6*

### **Telephone Training School**

"I didn't say quite that," answered Bob. "I was thinking of a training school for telephonists, and as it's chiefly a girl's job I thought Susan might be more interested in it than you boys would."

"And what will you do with us?" persisted the small boy.

"Wait and see," was Bob's answer again. Then he teased, "But perhaps you'd rather not come with Susan and me on another bus journey?"

"Oh, please!" they begged, and John declared, "It's nice to see the country, whichever way we go."

"But your parents won't thank me for borrowing you so often," remarked Bob.

"They won't mind—they'll say it's not often we get the chance to learn so much," answered John wisely.

"Perhaps!" exclaimed Bob.

Next morning, on the bus, he refused to tell Susan anything about what she was to see and hear, for he said the people at the Training School would explain things far better than he could.

The weather had turned bad-tempered, and it was pleasant to get indoors and away from the streaming rain. Miss Woods, assistant to the Officer-in-Charge of the School, knew that Susan was coming, and was waiting for her. So the other two left Susan in Miss Woods' office, and went off with Bob.

Susan was introduced to Miss Woods, who said, "Now,



*Training school: learning about trunk calls*

my dear, are there any questions you want to ask, or shall I start talking, and you can stop me when you think of something?"

"Well," answered Susan, "I should like to know how old the girls who come here are."

"Good," said Miss Woods. "We take girls from fifteen upwards, and they have to be accepted by the local Post Office representative, who might be the Head Postmaster or the Telephone Manager, before they start training. They come to the school from miles around, and some who come from a long way away live in rooms where their landladies soon begin to mother them."

"Do they generally like being here?" asked Susan, thinking it seemed rather pleasant.

"So much so that they sometimes cry when they have to leave the school and their friends at the end of the course. A



*Training School: general instruction*

course lasts four, five or six weeks, according to the type of exchange the girls are going to work on.

"Every day the girls have two lectures, and class instruction before and after lectures. In class they practise on dummy switchboards, and ask and answer questions, just as if they were real telephonists."

"It sounds like a game," said Susan.

"Sometimes it looks like one," answered Miss Woods. "But it's serious to them, because they're learning to earn a living. Now, would you like to see how we work?"

"Oh, yes, please," begged Susan, jumping up.

"Well, we'll go to a classroom first, and you can listen to a lecture. Then we'll visit another room, and see how the girls practise what they've just been learning."

The lecture that afternoon was on "Personal Calls", and showed what happened when a customer wanted to speak to a

particular person when making a trunk call. The lecturer would sometimes take the place of the customer, and sometimes that of the operator, or the person at the other end. She taught the girls the right questions to ask, and the right sort of answers to give, and they wrote notes to remind themselves.

Susan looked round the classroom. The girls seemed a lot older than herself, but they were friendly, and not too busy to smile at her. In front of each girl was a card, with her name, and the name of the place she came from, often quite a long distance away.

The lecture ended, and the girls began to move. "We'll follow these two," said Miss Woods. "They're going to practise now."

The next room was like a tiny manual exchange, where several instructors sat in front of a dummy switchboard, each with a pupil on either side. The pupils were "operators", and had to answer "customers' " calls, and make imaginary contact with other exchanges, practising the questions and answers they had just learnt. At the other end of each line an instructor was helping by providing the other part of the conversation.

Miss Woods slipped an earphone over Susan's head, and whispered, "Listen quietly, and you will hear what these two are up to." And after that Susan sat absorbed until the practice was over for the girls.

"How long have they been here?" she asked Miss Woods.

"This is their fourth week, and they're getting on well," she answered. "When they've finished at the school they will visit a real exchange for a few weeks, to get used to operating conditions. Then they'll start working as fully qualified operators without special supervision."

"Do all the girls get through?" asked Susan, feeling that she might not be clever enough to do so herself.

"Most of them do. In fact, they love it, and there aren't many we have to turn down as unsuitable."





*Training School: practice at a dummy switchboard*

As they went out into the corridor again, Miss Woods said, "We try to make girls happy here, and to teach them to be friendly towards customers. And as we want to turn out good telephonists we tell them to remember three things."

"What are they?" asked Susan curiously.

"To be accurate, polite, and speedy—and the first two are the most important. Hello, there are your people," she went on, catching sight of Bob peering through the door. "I'll leave you now, and I hope you've found it interesting."

"Thank you so much for everything," said Susan. "It must be fun to be a telephone girl."



*An Engineer at work at the Post Office television control in London*

## *Chapter 7*

### **More About Training, and the Future**

"Bob's been telling us what boys can go in for," said Paul as they climbed on to the Idfield bus. "And I think I'll be a 'Youth in Training'."

"Whatever's that?" asked his sister, looking mystified.

Without answering, Paul went on, "Of course, I shall have to wait until I leave ordinary school. Then I can take what he calls the 'Youths' Two Year Training Course', and do all sorts of telephone work."

"You'll soon give up that idea," declared his sister.

"Oh, no, I shan't. And I'll go on learning things until I'm quite an old man—at least fifty—for there's a special school somewhere. Tell her what you said about that, please, Bob."

"It's in Stone, in Staffordshire," Bob explained, "and I told John and Paul that Post Office engineers go there to be trained in everything connected with automatic exchanges, and other things to do with telegraph and telephone engineering."

"Yes, and they can learn about teleprinters, and how to mend and adjust automatic switches," interrupted Paul. "I wish I hadn't so long to wait!"

Bob laughed, and explained, "Paul asked if there weren't telephone boys as well as telephone girls, and that set me telling him that young people who go into the Post Office have every chance to carry on with learning things. They can attend classes one day a week, on general subjects, or go to evening school. And the engineers can study at technical colleges or by post for examinations. We send some of our brighter boys to a university to study for a degree."

"Yes, and *I* shall remember that," said John suddenly. "I really am interested in the Post Office, while Paul only thinks he is."

Paul missed that taunt, for just then he was busy staring through the window, and counting telephone poles, so John went on, "You know, we've learnt an awful lot about the Post Office during this holiday. Mr. Rayne got us interested, and I'm going to talk to him again before we leave. I can tell him now what we've heard about telephones and telegraphs."

"He said he hoped you would," Bob answered, and went on, "Well, I'll drop off here, as I've an errand to do. Good-bye to you all, and thanks very much for listening to me."

"No! We should say 'Thank you', and you should answer, 'It's a pleasure!'" corrected Paul.

The others laughed, and John rumpled Paul's hair. "You are a little idiot," he said.

Bob spoke to the driver, who stopped for him on the outskirts of the village. The children waved to him until he was out of sight.

That evening, when the post office had drawn its blinds for the night, John went across the street and found Mr. Rayne working in his garden.

"Please, are you too busy to listen to me?" he asked. "I'm the cat's whiskers on telephones and telegraphs now."

"That's grand," answered Mr. Rayne. "Give me another five minutes and then we'll go indoors and talk."

Presently John was sitting in the little room at the back of the post office, telling Mr. Rayne and his grey cat all the important things he had learned from Bob.

"Well," said the sub-postmaster at the end of the recital, "I told you he was an expert. I was right, wasn't I?"

"You were," John agreed. "But I've just thought of one thing we never talked about."

"Oh, and what's that?" asked Mr. Rayne.



*The Post Office research station at Dollis Hill in North-West London*

“Broadcasting and television. Doesn’t the Post Office deal with that?”

“Yes, very much so, especially for very long-distance messages. Radio is very useful to the Post Office, and the Post Office to radio. If we switch on at any time of day or night, messages will be on the air. They may come from broadcasting stations in this country or anywhere in the world. Radio is also used by police, fire brigades and by ambulance services, and for keeping in touch with shipping.”

“And doesn’t the Post Office have to decide who shall use the various wavelengths, so as to prevent signals getting mixed up?” asked John.

“Yes, but only in this country, of course, though we try to reach agreement with other countries as well; and it also decides what power the different transmitters are to have.”

“Often, when I’ve been watching TV at home, I’ve



*Part of the Post Office Central Training School at Stone in Staffordshire*

wondered how it was possible to jump so quickly from one place to another, especially when it was something out of doors. Do you know how it's done?" asked John.

"That's the Post Office at work again," Mr. Rayne told him. "There are special wires in main telephone cables which are used to set up 'links' for broadcasting and viewing. And Post Office engineers also set up special circuits for special occasions such as the Oxford and Cambridge boat race—sometimes as many as two thousand a month. The Post Office Television Control is in the heart of London, and there are also other centres in different parts of the country."

Mr. Rayne paused a minute, before adding, "I expect you'll be interested to hear about telephone plans for the future. The Postmaster General has said he is trying to find out what the public wants and expects, and he has spoken of his plans for the coming years. He states, 'My policy . . . is to encourage greater

use of the telephone by making calls cheap, quick and easy to make.'"

Suddenly, Mr. Rayne said, "You'll hardly believe it, John, but many people who are on the telephone make as few as two calls a day, on average, although each instrument with its exchange line costs the Post Office about £110 to install. Things should get better, though, because the area in which a call costs only 2½d. (or 4d. from a kiosk) was greatly increased in January 1958. Any more questions?"

"Yes. I've heard people talking of 'automation' in the telephone service, but there wasn't time to ask Bob what that was," said John. "Can you tell me, please?"

"Well, we've been steadily replacing manual exchanges with automatic ones for many years, though the 1939-1945 war set back the programme a great deal. Now we're pushing ahead and before long nearly all exchanges will be automatic and many customers will be able to dial all their calls—including trunk calls—direct."

"But is that better?" asked the boy.

"Much. For one thing, it will reduce staff and therefore save money. In fact we're heading towards a telephone system that will be entirely automatic, with every customer dialling his own calls to any other telephone in the country. GRACE will look after that," ended Mr. Rayne.

"Who's she?" asked John, looking puzzled.

"It is a machine. And it's called GRACE because that stands for 'Group Routing And Charging Equipment'. When GRACE is working at all exchanges you'll be able to 'phone from John o' Groats at the top of Scotland, to Land's End, on the tip of Cornwall, for 2d. Mind you, for that long way you'll get only 12 seconds' time for 2d., or 18 seconds during cheap rate periods, but it'll still be a lot cheaper than the same call under the present system. By the way, the 2d. applies only to calls from private 'phones. The charge from a kiosk will be 3d."



*A television camera in action at a swimming race  
(Courtesy British Broadcasting Corporation)*

"And won't there be any telephone operators left?" asked John.

"Oh, yes. Even with GRACE we shan't be able to do without them altogether. You see, there'll always be people with queries, and asking for advice. So, although there will be fewer operators, there must be some to help customers in difficulty and to connect any calls which can't be dialled direct. But still, the staff reductions should lead to savings of millions of pounds a year.

John whistled. "Good gracious, I can hardly think of so much money," he said.

"It does seem a lot to us ordinary, everyday people," agreed Mr. Rayne. "The Post Office is searching all the time to find ways of saving money and also to give better service to the public. And experiments by Post Office engineers, especially those made at the research station at Dollis Hill in London, are



bringing us nearer to the time when the Postmaster General's wish will come true."

"What's that?" asked John.

"That 'there will be a telephone in every home, fully used, and anyone will be able to pick up a telephone and speak to anyone, anywhere, quickly, clearly and at reasonable cost'."

"Sounds good to me," declared John. "I wish I could help with it."

"Well, you can. The Postmaster General also says that 'the success of our plans depends on the co-operation of the public, and on their dialling their own calls when this is possible', and so on. Aren't you one of the public, and won't you probably use the telephone long before you're grown up?"

"Of course," John agreed. Then he asked, "Can you hear a snuffling and a shuffling at the window? That's the other two nosing round."

"Hi, there," Paul called through the glass, "it's bedtime, and you've got to tell us what you've been talking about first!"

"Oh, that kid!" exclaimed John. Then he called back, "I'll tell you tomorrow. But, anyway, remember I don't go to bed at the same time as you!"

*There is another book by Mary Moore about John, Susan and Paul, called "Our Post Office."*

*Teachers who would like to know more  
about Post Office publications for schools  
should write to their local Head Postmaster  
or Telephone Manager.*



