

# IN YOUR WORKSHOP



*This month Smithy the Serviceman gives his able assistant, Dick, some information on the basic facts of efficient working*

"AND THERE'S ANOTHER THING," SAID Smithy truculently, "why is the pianist in a skiffle band not allowed to sit down?"

Dick suppressed a grin. He and the Serviceman were engaged in their perennial argument about modern "pop" music, Dick hotly defending the latest offerings of the record companies and Smithy just as hotly attacking them.

"I think it's nothing short of cruel," continued Smithy. "The piano keyboard is just the right height to sit down at, but the strain on the lumbar muscles for anyone who has to play it standing up must be something shocking."

"A keen musician wouldn't notice it," interjected Dick, trying to keep his face straight. "He'd just take it in his stride."

"Nonsense!" retorted Smithy. "I think it's an open-and-shut case for the Factory Inspector to look into. If not," he added, darkly, "for the Musicians' Union. What are you sniggering about?"

"I'm sorry, Smithy," laughed Dick, "but I just couldn't help it. After all, you can't slate the music just because the pianist has to stand up."

"Of course I can," exploded the Serviceman. "The whole thing's so damned silly. Can you imagine Moiseiwitsch standing up when he plays?"

"Ah, that's different. Isn't he that new chap who only plays trad?"

"Trad?"

"New Orleans."

Smithy looked baffled.

"Well," he said, after a moment, "let's try

another tack. Don't you think the music would sound better if the players were able to do their jobs more efficiently?"

"No, not really."

There was a further moment's silence as Smithy considered Dick's remark.

"Hmm," he said, eventually, "perhaps you're right."

## Time and Motion Study

However, Smithy didn't seem prepared to let this particular aspect of the argument peter out.

"No, but joking apart," he resumed, "I don't want to dismiss too lightly the idea of efficient operation, as resulting for instance from such things as Time and Motion Study. Applying Time and Motion Study to a skiffle band could produce interesting results and might even do something to the aesthetic—and I choke over the word—quality of the sound it makes."

"It's me that's a little lost now," complained Dick. "To start with, I'm not certain just what Time and Motion really stands for."

"Ah," said Smithy, gratified at being able to expound on one of his favourite subjects. "Well, really, it's just one of those common-sense things which has become specialised and which has grown into a little science of its own. Time and Motion Study started off when people commenced attempting to reduce the time taken to do assembly jobs in mass-production factories, and also to reduce the fatigue experienced by the operators who did them."

"Why the latter?"

"There are several reasons," said Smithy. "From the hard-headed business point of view you could say that the less fatigue an operator suffers, the less mistakes he, or she, makes on the operation. But it isn't only that, of course. It is obviously sensible to keep fatigue down to the minimum from the point of view of the morale of the operator."

"It sounds a bit cold-blooded to me," remarked Dick. "As though you were thinking of the operator as a machine."

A light was starting to dawn in Dick's eyes.

"I begin to see what you're getting at," he exclaimed. "When I saw the first layout I thought it seemed sensible enough. But your second layout is so obviously better that it sticks out a mile! And yet the change seems to be of a very simple order."

"It is simple," agreed Smithy. "As are so many other things after they've been explained to you. Now, what I've shown you

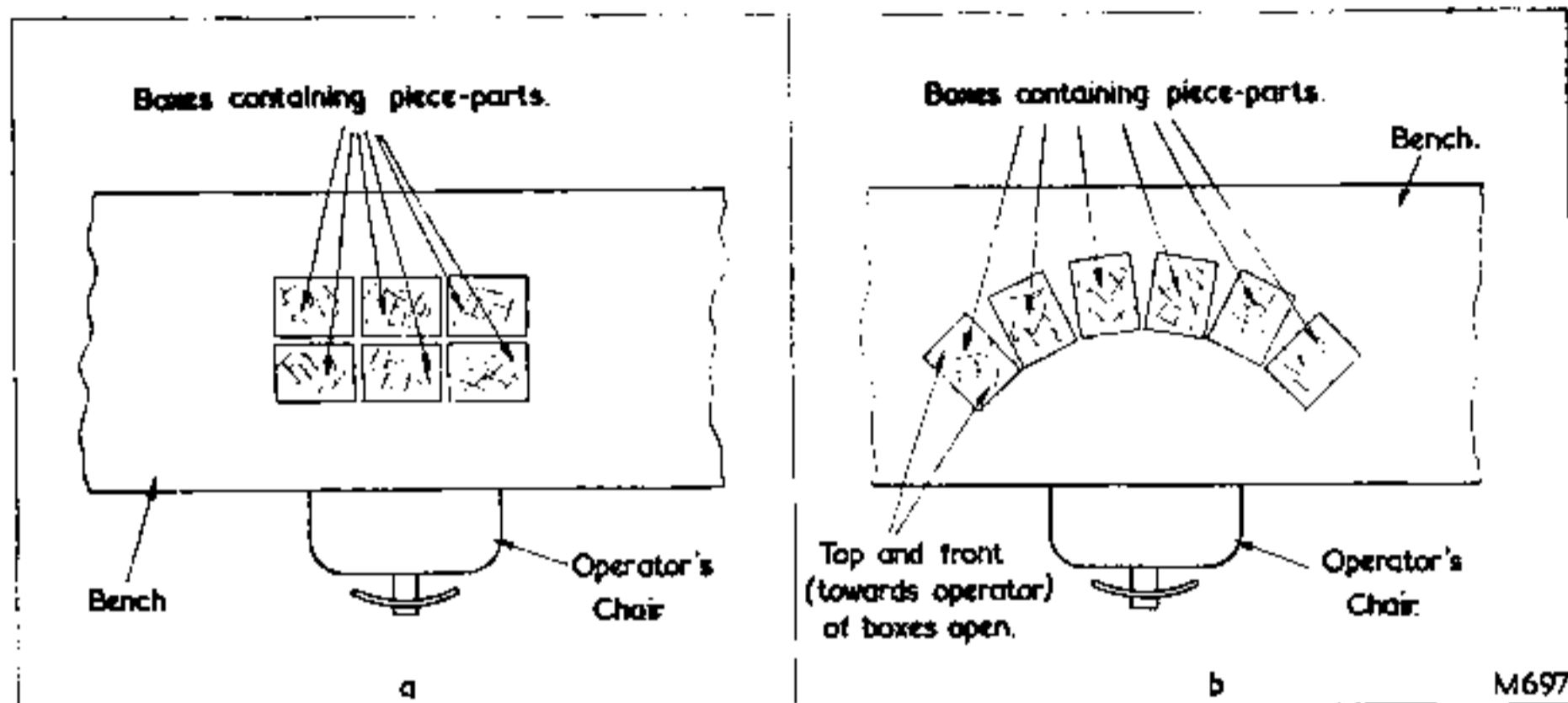


Fig. 1 (a) An inefficient work layout. The operator assembles the six piece-parts in the boxes. (b) A much more efficient layout, by means of which the operator may pick up the piece-parts more quickly and easily

"To be quite honest, it always sounds a little that way to me as well," confessed Smithy. "But I must repeat that Time and Motion ideas all come back to common-sense when you analyse them. For instance, here's the sort of operation layout you used to get in a factory in the old days (Fig. 1 (a)). The girl sitting at the bench in my sketch is supposed to assemble six different things together before she passes the completed article on to the next girl. All the six piece-parts are laid out in six little boxes in front of her."

"Seems sensible enough to me."

"Perhaps so," said the Serviceman, "but it can be improved. After the Time and Motion boys have had a go at a layout of this nature it would probably look something like this (Fig. 1 (b)). In this case all the operator's piece-parts now appear in boxes arranged in an arc of a circle. The boxes all open out towards her and she can see at a glance what they contain. Also, they're all the same distance away from her so she only has to think in terms of *direction* when she reaches out for a particular part. With the old idea she not only had to think of *direction* but of *distance* as well."

is an obvious example of the sort of thing that Time and Motion techniques can achieve. I'm quite certain that much the same sort of idea can be applied to servicing."

"But our sort of work is different from factory work," protested Dick. "In a factory people do the same thing over and over again, whereas we are changing about all the time."

"That's not entirely true," said Smithy. "There are many instances when you carry on with a routine and unvarying job for quite long periods of time. As, for example, when you have an awkward snag, and you want to contemplatively prod the chassis around a bit. Let's assume that the snag you're chasing is of the type where you need a test-meter only. In this case I think that there's nothing better than laying things out like this. (Fig. 2 (a).) Give yourself plenty of free surface area—that's *most* important. Then put your testmeter up really *close* to the chassis, so that you can well-nigh see its needle out of the corner of your eye whilst you're prodding. Quite often it is difficult to hold a meter prod firmly in position on a particular test point, and so you don't want to have your eye travel very far to see the

reading given by the test connection. Indeed, with my layout, all you need do is to roll your eye slightly to the right and the deed is done. There's no necessity even to shift your head. Certainly not your body."

"I suppose you've got something there," said Dick a little grudgingly, "but if you feel that way, why do we have shelves fixed above all the benches in the Workshop? Aren't testmeters and things meant to go on these?"

"In the main, no," said Smithy, "and, quite definitely, not test equipment in use and of the type which has to be frequently consulted. Look, here's what happens if you put a testmeter on a shelf. (Fig. 3 (a).) As you can see straightaway, whenever you want to look at the meter scale you have to at least move your head, and very probably alter your body position as well. Which means that you take quite a lot of your attention away from the chassis. The result is that, in many cases, your test prod will fall off the point to which it is supposed to connect, and may even touch a point you *don't* want to connect to. Also, having the meter on the shelf means that whilst you're looking inside the chassis you may miss those occasions when its needle swings hard over. If the meter's alongside the chassis you can usually see this effect quickly enough to remove the test prod before any serious damage gets done. Another point is that, with the shelf, you have to reach up every time you want to change the meter range. When the meter's on the bench its range switch is right under your hand. Yet again, there's a strong possibility that the meter on the shelf will be further away from you than it would be on the bench so that, firstly, you can't see its scale so clearly and, secondly, you have to re-focus your eyes each time you look up at it."

"Couldn't you get over this last difficulty by making the shelf poke out a bit more?"

"Well, you *could*," said Smithy, somewhat dubiously, "but you'd then find that either you reduce your effective bench working area or you reduce your shelf accessibility. If a shelf which pokes out a long way is too low it makes it difficult to work below it, especially on large and cumbersome chassis. (Fig. 3 (b).) If you raise it, to overcome this snag, then it means you have to reach too high."

"You must admit," grinned Dick, "that you are exaggerating these effects in your sketches."

"Perhaps so," conceded Smithy. "But a little exaggeration does help sometimes to bring home an argument. Before finishing on this subject, however, I will agree that if, due to lack of floor space, you have to use a narrow bench, you can more satisfactorily fix up a shelf whose distance to the eye is similar

to that of the surface of the bench. (Fig. 3 (c).) But, even so, I still wouldn't put any testmeter in continual use on such a shelf."

### Finer Points

"Okey-dokey," said Dick. "I'm prepared to be convinced. The testmeter stays on the bench close to the chassis being serviced."

"Right," said Smithy briskly. "Now the next thing to consider is the other information you need for fault diagnosis. If the chassis is that of a sound radio you want to hear what sort of noise comes out of its speaker. To do this you either hitch the output circuit to the bench speaker, or use the set's own speaker. You know, it's a good thing to mount whichever speaker you're using fairly close to, and 'aimed' at, your ears; because you can then hear hiss and tops much more readily. You can arrange for this quite easily so far as the bench speaker is concerned. If the job being serviced is a t.v. chassis, you will very frequently want to keep an eye on the screen, whereupon we call in one of our mirrors.<sup>1</sup> Like so. (Fig. 2 (b).)

"Well, our layout seems very sensible up to now," remarked Dick. "Once you've got everything set up you just plant yourself on your stool and stay there till you find the snag."

"Which is the entire basis of the idea," exclaimed Smithy. "Now, you'll obviously want a few tools and things. Most of these you can keep alongside you on the bench—preferably in a shallow box wherein you

<sup>1</sup> These were described in last month's "In Your Workshop."

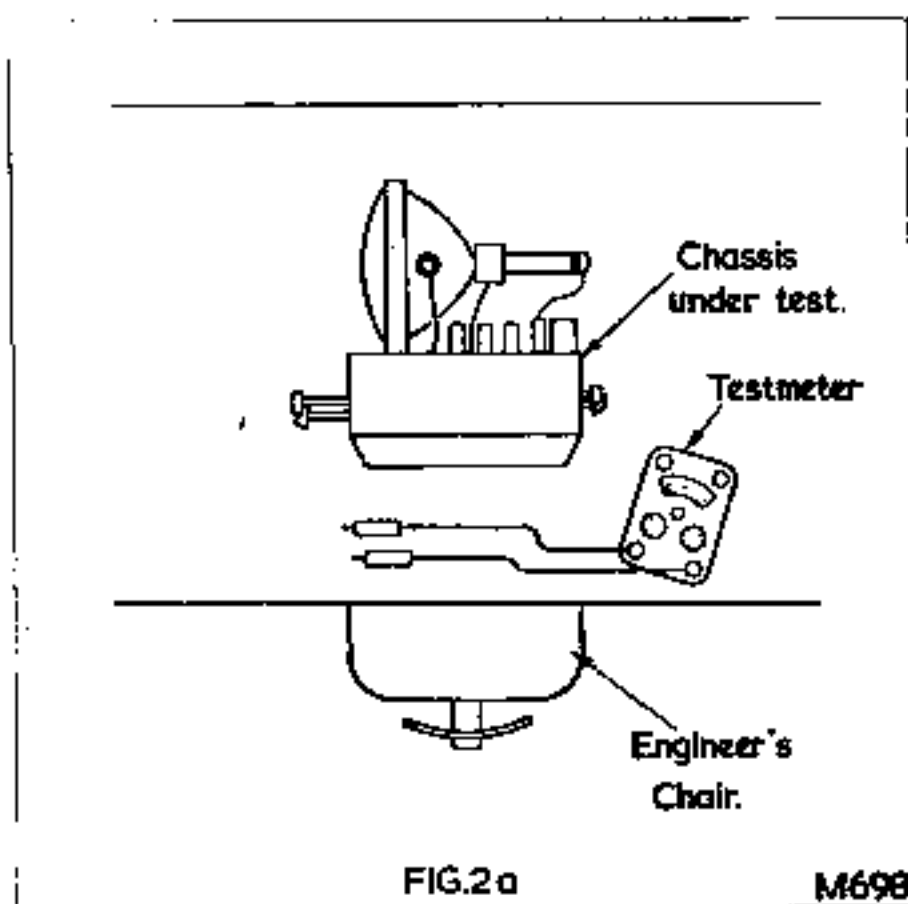


Fig. 2. Successive steps in making up an efficient trouble-shooting work layout. (a) The testmeter should be placed on the bench close to the chassis under test

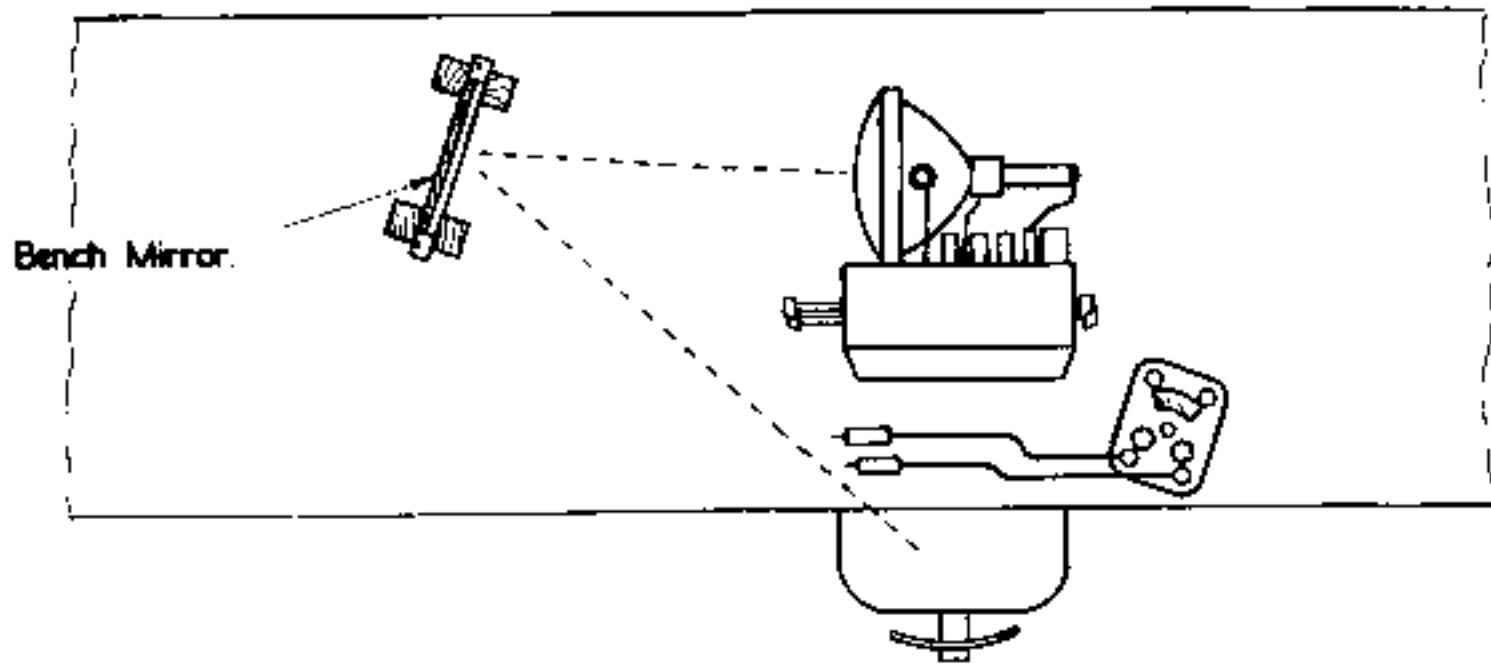


FIG. 2b

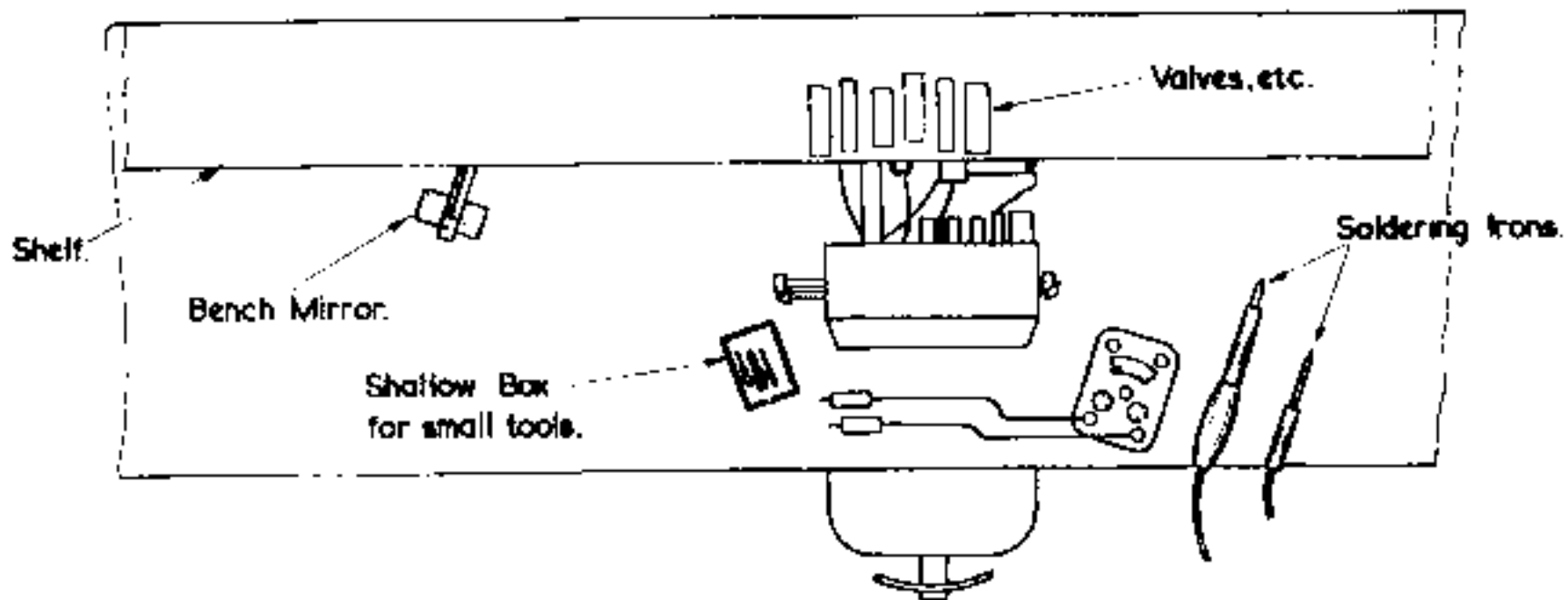


FIG. 2c

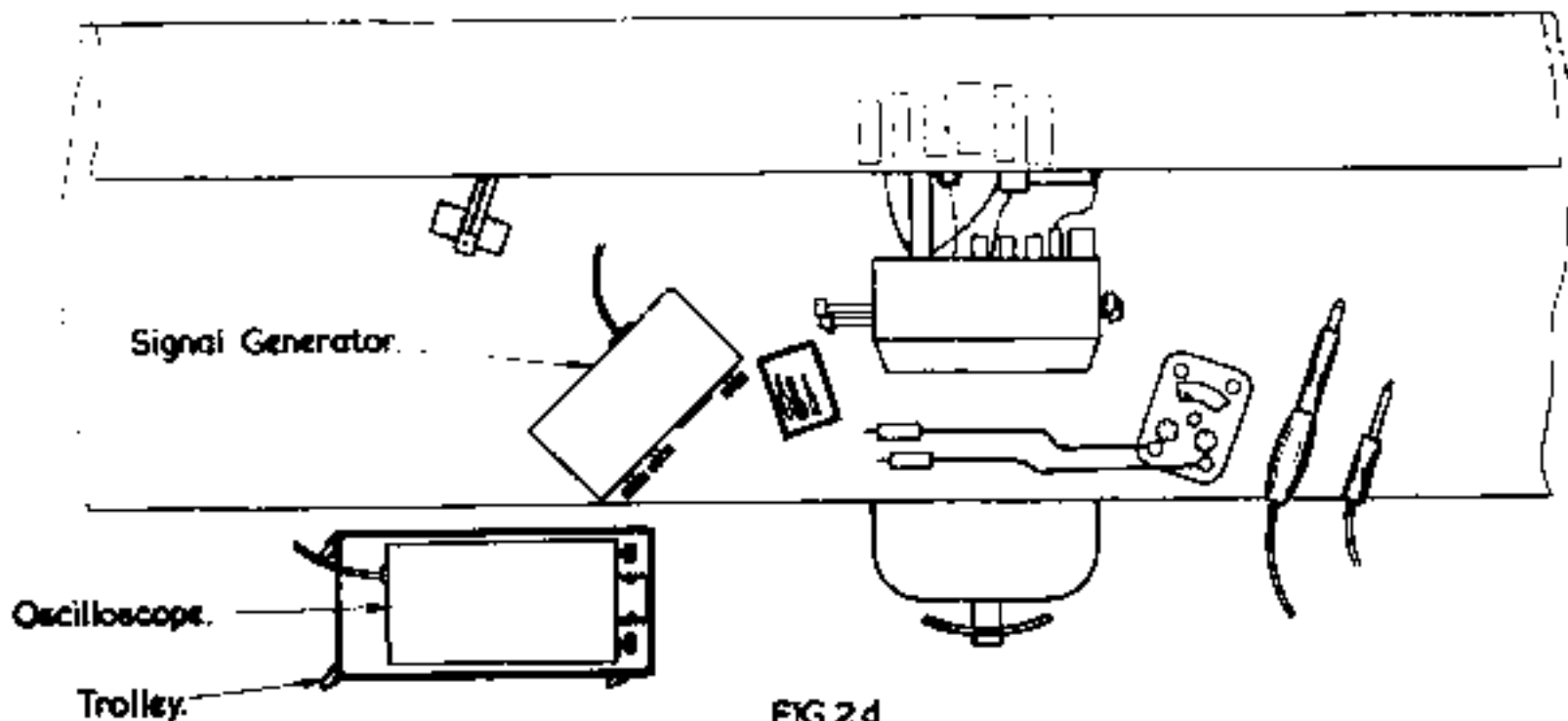


FIG. 2d

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Fig. 2 (b) A conveniently placed mirror enables the engineer to see the receiver screen without moving from his chair. (c) A shelf is useful for holding the more frequently employed spare parts and valves. Also, soldering irons and small tools should be kept within easy range. (d) Large, bulky test instruments may be fairly readily inserted into the layout. A trolley for the oscilloscope is a useful adjunct

can see them and pick them up readily."  
 "And how long will they stay in the box?"  
 said Dick, somewhat sarcastically.

"If you're like me, not very long,"  
 admitted the Serviceman. "They will soon  
 spread themselves over the surface of the

bench. Nevertheless, the mere existence of a box seems to inspire a homing instinct in the tools and they should be in it *most* of the time! Don't forget that you won't need very many tools for actual trouble-shooting. Hammers and jemmys are O.K. for initially getting the works out of the box, but once the chassis is on the bench it's mostly light engineering."

"What about solder and soldering iron?"

"What I usually do with solder," said Smithy, "is to have about a yard or two of it in the shallow box along with the tools. You can easily make it up into a convenient coil by wrapping it round your hand.

"So far as soldering irons are concerned it's not a bad idea to have *two*, one big and one small, and both switched on and ready to go. The small one can be one of those modern tiny irons which are so excellent for the awkward little jobs you get these days. The big one is retained for tackling the beefier joints."

"I see," said Dick musingly. "All this sounds excellent in theory, but I can't see it turning out quite so well in practice. For instance, I always have to keep leaving the bench for different things whilst I'm servicing."

"True enough," said Smithy, "but you must remember that I'm talking about trouble-shooting only. I appreciate that, after you've *found* your fault, you may have to go to the spares cupboard to find a replacement for the faulty component. In the meantime, however, you will have saved time and energy in the process of *tracing* that component. And, of course, there's nothing to stop you keeping a stock of the more commonly encountered resistors and condensers fairly close at hand, together with a representative selection of valves. These can go on your shelf, if you like. Dear me, my sketch is getting quite detailed now." (Fig. 2 (c)).

"Detailed it may be," said Dick, "but it still looks too good to be true. There's not even *half* enough junk around for my liking!"

"Fair comment," grinned Smithy. "I would be the first to agree that a really tidy bench often indicates that there's not much work going on! You must assume that the working space in my sketch has been cleared of odds and ends."

"What about ancillary equipment? Such as the signal genny?"

"Ah," said Smithy. "Now things begin to get more difficult. I'm a great believer in really small signal gennies—provided they're efficient enough—because you can put these on the bench with their scales and knobs pointing upwards, just like the testmeter. Nevertheless, even if the signal genny is large

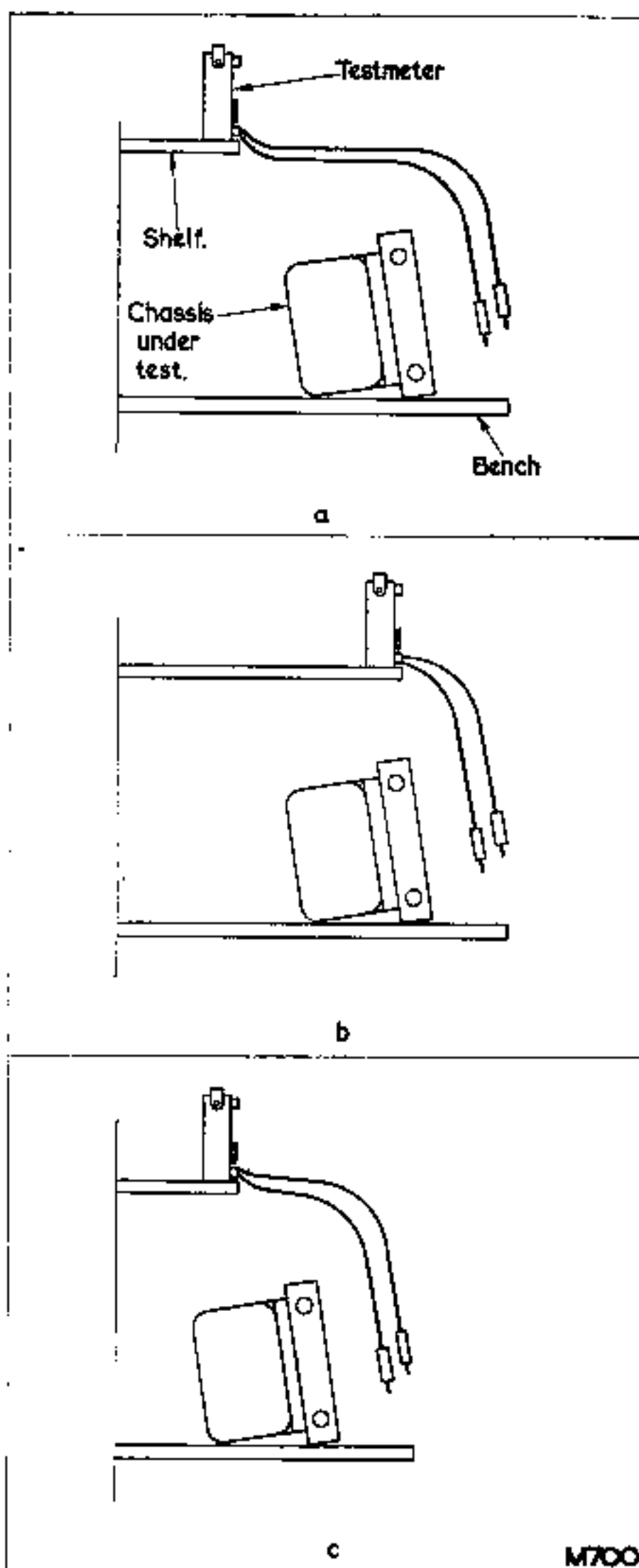


Fig. 3 (a) It is normally inconvenient to have test equipment in constant use mounted on a shelf. (b) Extending the shelf has the effect of limiting the working area of the bench. (c) It is sometimes possible to reach a compromise solution on shelf location when a narrow bench is employed. Even so it is not recommended that such a shelf be employed for test equipment in constant use

and cumbersome it's still worth while trying to keep it at bench level. The signal genny can frequently go on the other side of the

chassis to the testmeter, with the result that the layout is still quite reasonable.

"Other bits of equipment raise problems, too. 'Scopes are especially liable to be heavy and cumbersome, whereupon it isn't a bad idea to mount them on trolleys which can be wheeled up to the bench when required.<sup>2</sup> If I add a signal genny and a 'scope to my sketch I get a layout like this. (Fig. 2 (d).) Even now, with all the heavy gear around, the chap who's doing the work still has things within comfortable reaching distance."

"I'll agree that everything is close to hand," said Dick, "but now that things are getting more complicated another point comes up. Aren't you liable to waste time getting all this stuff into position?"

"Not half as much as you do when you have to keep moving around and leaving your stool to adjust knobs and get things," replied the Serviceman. "Incidentally, you may have noticed that I've used the same basic principle for the trouble-shooting layout as I showed you, right at the beginning, for the operator assembling those six piece-points. All the tools, scales and twiddles which the service engineer has to use or attend to are laid out

<sup>2</sup> Specially designed trolleys for oscilloscopes are available from the manufacturers of some of the larger instruments.

around him in an arc of a circle. All more or less at the same distance from him, and all more or less at the same level."

"Why, so you have!" exclaimed Dick. "I hadn't realised that."

### Preparing For Work

"Right," said Smithy, rubbing his hands together briskly, "and now let's get back to the grindstone."

"O.K., Smithy. But let me first take advantage of your advice and clear a really man-sized working area on my bench."

Whereupon Dick, with a careless sweep of his arm, pushed all the detritus from the front of his bench up against the back. This action resulted in considerable rattle and clatter, together with that unpleasant scraping noise which is given when valve rubs against valve. Some of the components escaped from the unstable pile which Dick had created, and rolled, or fell, forward. Dick merely flicked these back again, whereupon they remained indeterminately in position. Satisfied, Dick turned round to the Serviceman.

But Smithy, who had been watching his assistant's actions with horror, had turned away.

"Just dig," he remarked hopelessly to the Workshop. "just dig my crazy boy."