high score workers presented high turnover rates. In a third department the highest turnover rate occurred among those of average score. A study of the job specifications of this department showed that it contained two types of work, one involving routine operations and another calling for a large amount of diversity of response, perceptual discrimination and judgment. In the above cases several different optimum scores would become the standard as to the amount of mental alertness required in applicants.

These brief illustrations present principles familiar to anyone who deals with job specifications, with materials' specifications, with standards of inspection, and so on. Objectives are set up, such as ability to do the work, a range of efficiency in doing it, a certain degree of permanency, the possibility of promotion to greater degree of responsibility (more complex jobs), and satisfaction of the individual at work. The tests and other methods of selection and placement are invented, investigated, and standardized with reference to attainment of those objectives which are deemed most important.

Special Aptitude Tests

Within the standard ranges of general ability, whether these ranges be determined for intellectual, mechanical, social, or temperamental capacities, it is often valuable to seek for special aptitudes with reference to individual jobs. In certain cases, such as musical talent, the analysis shows the special aptitude to be a highly complex group of special abilities. In other cases one or more relatively simple factors suffice to place the operator high among his fellow workers. We present one of these simpler operations to illustrate the procedure.

The test is one of finger dexterity. The workers, largely women, are assigned to fine meter or instrument assembly work. The test was standardized on 1021 women, during a period of three years.

Specifications for Apparatus[1]

Use three hundred brass pins, 0.072 inch in diameter and one inch in length; and a metal plate seven-eighths of an inch in thickness, five and three-fourths inches wide by twelve inches long. In one half of the plate drill one hundred holes, arranged in ten lines of ten each, one-half inch apart both ways; depth of holes, three-fourths of an inch; diameter of holes, 0.196 inch (No. 9 drill). The other half of the plate consists of a shallow tray approximately five by six inches with gently sloping sides so that the pins cannot be lifted by gathering them against the side of the tray.

Directions

Show candidate the pin board with three hundred pins assembled, three in each hole. Say: "There are three pins in each hole. I will tip them all out and get you to put them back, three in each hole, as fast as you can. Use only your right hand. Try to pick them up three at a time because you cannot go fast enough taking them one by one." Allow candidate to place thirty pins, thus filling up ten holes for practice. Tip out these thirty again, allow a moment's rest and then time accurately with a stop watch in minutes and hundredths of minutes the time required from placing the first pin to the last. If either two or four pins are assembled by mistake in one or two of the holes do not count against the candidate, and if because of such a mistake two or three pins are left over at the end do not require the subject to find where these pins belong and assemble them. The test measures finger dexterity, not accuracy in counting.

The percentiles based on 1021 women and 158 men are:

Rates	Women	Men
Fastest Speed	5.70 minutes	5.70 minutes
25 percentile	7.10 minutes	7.70 minutes
50 percentile	7.70 minutes	8.30 minutes
75 percentile	8.30 minutes	9.00 minutes
Slowest speed	over 15 minutes	over 15 minutes

Seventy-seven women engaged to do fine meter or instrument work distribute themselves as shown below after being given full opportunity to succeed at the tasks:

Quartiles Based on 1021 Cases	Scores	Percentage of Successes at Actual Work	Percentage of Failures at Actual Work	Percentage of Terminations Including Failures
1	0 — 7.10	88	0	12
2	7.11 — 7.70	89	0	11
3	7.71 — 8.30	50	29	50
4	8.31 or more	40	40	60

The writers say further: "Regardless of whether or not one believes in tests of this character, the employment manager who has among his selections no failures and 11 or 12 per cent leaving, is more successful than one with 29 to 40 per cent failures, and 50 to 60 per cent leaving. This result can be accomplished by selecting applicants who score above the median in such a test as this." Subsequent use of the test in selection has shown the validity of the standards thus established.

In the laboratory, the psychologist has developed numerous special measures designed to analyze the various mental factors. Experimental procedures

[1] Hines, Mildred, and O'Conner, Johnson, "A Measure of Finger Dexterity," *The Personnel Journal*, Vol. IV, 1925-26, pp. 379-382.

are available for analyzing such characteristics as motor capacities, sensory processes, and learning, perception, memory, reasoning, ingenuity and imagination, temperament, character. But few of these have yet been adapted to practical industrial use. Undoubtedly all of them will gradually find a place in the development of labor standards in many types of work. Methods of formulating job specifications do not as yet readily lend themselves to the type of analysis necessary to specify the particular mental process or group of processes essential to a specific task.

Two of the most interesting of recent attempts to analyze and adapt measures of human capacity to vocational adjustment are the interest analysis test and the social relations test. The first undertakes to show by individual responses to a large number of ordinary life situations that the reactions of persons successful in one of the professions or trades are significantly different from the reactions made by one in any other trade or profession. The social relations test endeavors to segregate those factors which make for easy and successful adjustments between individuals. Both types of test show promise of eventually being useful additions to what has already been accomplished on the general labor standardization program.

Information and Skill Tests

In contrast to the above types of tests the trade test and the information or knowledge test seek to determine the degree of skill or the understanding of the processes performed. Tests of these kinds would, in the above example, be based directly upon the work done by the seventy-seven women actually on the job. If applicants claimed previous experience, the tests would be applied to determine the degree of skill attained and the extent to which the applicant understood the work to be done. Such tests are designed to measure acquired abilities.

The types of trade tests are oral, written and performance. Any one of the three may be used to gauge either the skill or the knowledge of the candidate. If skill is to be judged, use of the oral and written tests is based on the close relationship which exists in most cases of expertness between knowledge about the job and the ability to do it. Such a statement is, of course, limited in its application primarily to skilled trades and to candidates who claim experience. It was found, for example, that performance tests only would give a safe estimate of the truck-driver's skill. The knowledge tests have been most highly developed in the United States within school systems or in corporation schools.

Such tests are difficult to construct. The limits of validity and accuracy are more closely drawn than in the case of capacity tests. This fact indicates, not that it is a simpler task to construct general and special capacity or aptitude tests, but rather that we know less about the mental aspects of the criteria with which they should be compared than we do about the other aspects.

A further difficulty arises in respect to trade and specific information tests. Trades in general have fundamental principles, but the modifications of them in different factories and to different materials make it hard to construct a test free of the peculiarities of the specific job. If successful in this latter respect the test may fail of its special purpose of enabling the employment manager to select men fitted for jobs within his plant. Probably the best solution of this difficulty lies in the co-operation of industrial concerns in building their job specifications and in setting up standard requirements on the basis of tests also constructed co-operatively.

The problem is largely one of developing the necessary skill in the preparation and standardization of these tools. Considerable acumen is also essential if time and money are not to be wasted in working on standardizing data for departments which can be left to the last. An ambitious program can easily fall to the ground under its own weight. Improperly started it will engender more hatred and opposition than almost any other action of management. One of the simplest illustrations of this occurs in giving a test involving language or terms not thoroughly familiar to the subjects. Picture tests and non-verbal tests of several types have been devised to meet this difficulty. Some of these do not require the use of verbal language on the part of either the tester or the testee. The introduction of a labor standardization program should proceed with the most obvious competitive devices in the beginning. Those used should be so carefully prepared that they can be handled by men well known to the candidates, such as foremen, assistant foremen and even by the workers themselves.