

COUNTING OUR PEOPLE BY MACHINE.
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The counting at the end of each decade of every man, woman, and child in the United States is one of the biggest undertakings the government is called upon to assume. To facilitate counting, machines will be used invented by Mr. James Powers, a mechanical expert of the Census Bureau, for use in the thirteenth census, which were successfully tried in the recent Cuban census, and now in use in the Division of Vital Statistics of the Census Office.

The mechanical method for counting the census requires two types of machines, which are of equal importance, and each essential to the successful use of the other. The keynote of the system, however, is a punched card, which contains the data collected by the enumerators, who travel from house to house in every nook and corner of the land. The data include the nature and extent of our industries, the amount of our wealth, etc. By means of the punched card a tabulating machine mechanically classifies the data thus sent in to the Census Office by the enumerators. The location of the holes on the cards means everything to the tabulating machine, as will be seen later; for the special position of a hole within the limits of certain boundary lines on the cards means one thing, and in another position another thing. It is this location of a punched hole on a card that enables the tabulating machine to transfer the value of that particular position of a hole on a card to a number of counters, which classify the data and obtain totals.

The punching machine which was used in the eleventh census, and again with improvements at the twelfth census, was a rather simple affair, in which the pressure of a lever by hand was necessary for the punching of each and every individual hole. The machine recently invented for punching bears no resemblance to the old apparatus, and is run by electricity instead of hand power.

The new machine is built on the plan of a typewriter, with 240 keys. The operator instead of punching one hole at a time presses as many keys as may be necessary. After all the facts have thus been recorded by the keys, a bar resembling that of a space bar on a typewriter is pressed, which brings an electric motor into play, whereupon all the holes are punched at once without any effort on the part of the operator. The average number of cards punched per day at the Census Office with the hand puncher was 900, while with the new machine a speed of 4,000 cards per day is attained. In the old punching machine a hole was punched in a card every time a key was depressed. If an error was made the card had to be thrown away, thus wasting not only the cards but the operator's time. In the new machine each key is depressed independently of the others, and can be released at will without punching a hole or record-

ing a fact until the operator is ready to press the motor bar, which punches all the holes at once. Before the operator punches any holes the operator can look over the depressed keys and ascertain whether all are correct. If an error be discovered, the wrong key can be released and the error rectified before any punching is done. The color of the keys for each field of the card is different, which enables the operator at a glance to locate the keys representing the different fields of information. The cards are fed to the machine from the back by electricity.

To make this method clearer, study the accompanying picture of a card, which is now in use in the Vital

representing the people of the country have been punched, the Census Office will be enabled to announce immediately the totals as to the different classes of our population—males, females, natives, foreigners, white, colored, married, and single. Under the old system, when all the punching was done by hand, these figures were not available until the tabulating work was started.

After the transfer of information to the cards has been completed, the schedules from which the information is derived are filed among the government records, and all the work of statistical tabulation is done with these cards. One notices that the clerks working

on them cannot tell the names or addresses of the individuals for whom the cards stand, and that thus in the presentation of census tables the personal element is entirely lost.

After the cards have been put through the punching machine, they are ready for the tabulating machines. The operator puts the cards, one at a time with her right hand, into a box with a multiplicity of little spring-seated pins above the card and a corresponding series of mercury cups below it. As she moves

her hand from the machine to pick up another card she touches a spring on the lower edge of the pin box, which brings an electric motor into play. The pins which are in line with the holes of the second class on the card descend through the holes, and by touching the mercury below make so many electric contacts. Each pin and its mercury cup are terminals of a separate current passing through an electro-magnet controlling a counter or dial. Thus, referring again to the card, the current entering the field for *Col*, or *Color*, would have five possible paths. The routes diverge at the five points where holes in the cards might have been. Of these five routes four are closed by the surface of the card, and the current is compelled to go by the fifth, where the hole has been made, and is guided to the dial for *Color*, and so on in each field. These dials contain the various combinations of statistical information, from

R.S	R	O	A	Col	Sex	Month	Un	Age	Un	Con Cond	Sp-F	Sp-F	Sp Mother							
0	1	0	0	W	M	Jan	Feb	0	35	40	75	0	2	Dv	US	US	US	Hun	Boh	
1	0	1	1	B	F	Apr	May	5	50	45	70	1	3	Un	Mr	For	For	For	Iro	Ger
2	1	2	2	Un		Jul	Aug	10	25	50	65	0	4	US	Wd	Un	Un	Un	E-W	Can
3	2	3	3	Ch		Oct	Nov	15	20	55	60	5	60	x	x	x	x	Un	Ot	Ny
4	3	4	4	Sp															For	Dk
5	4	5	5	Cause of Death										Un	Occupation	x	Sec	Ity	Fra	
6	5	6	6	0	1	0	1	2	3	4	5	6	7	8	0	1	0	1	NO	Pol
7	6	7	7	2	3	17	10	15	14	13	11	10	9	2	8	2	3	4	5	6
8	7	8	8	4	5	18	10	20	21	22	23	24	25	26	4	5	11	10	9	8
9	8	9	9	6	7	35	34	33	32	31	30	29	28	27	3	7	12	13	14	15
10	9	0	9	8	9	33	37	33	39	40	41	42	43	44	8	9	21	20	19	17
11	0	1	0	55	54	53	52	51	50	49	48	47	46	45	22	23	24	25	26	27

One of the punched cards.

Statistics Division of the Census Office, and which is representative of all cards used in their new punching machine, a change in the symbol keys of the machine making it available for population work.

The holes are divided into two classes by the vertical lines on the left-hand side of the card. The first class, aided by the large numerals at the right-hand edge, identifies the person, and enables the census expert to find immediately the original entry from which the card was made; the second class gives all the statistical information regarding the person for whom the card was made. For instance, the *W* means that this person was white; the *M* means that the person was a male; the *Dec* that he died in December; the *20* and *4* that he was 24 years old; the *SG* that he was single; the *US* in the next three fields that he was born in the United States, as were both his parents. The two fields immediately below show his occupation at time of death, and also the cause of death. A similar card is being made in the Census Office for each death reported in the United States, and one will be punched for the many million inhabitants reported by the enumerators in the forthcoming census.

In connection with the invention of



Front view of the card-punching machine.

which the tables as finally set forth in the census volumes are made.

An automatic recording and printing system—on the plan of the familiar stock ticker—is connected with each dial. When the operator wishes to make a reading of the dials a button is pressed, with the left hand, and the figures on the dials are printed on the ticker paper, from which they can be read. The dials are automatically reset. In the machines used in former census work the dials had to be read and the results recorded by hand—a proceeding productive of many errors—and then all the dials had to be reset by hand, a time-consuming operation. The daily output of the old machines averaged 18,000 cards, while the new machines are counting 28,000 cards per day.

An occultation of Mars occurred on September 1st, which was observed by many astronomers, although the event is not of much scientific importance.



Rear of the new card-punching machine.



The new tabulating machine.

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this new machine, it is interesting to note that it will render it possible to announce the total population at the next decennial enumeration in record-breaking time; for automatic counters are attached to the keys, and register on a dial every time a hole is punched. Thus, just as soon as the 90,000,000 cards (more or less)