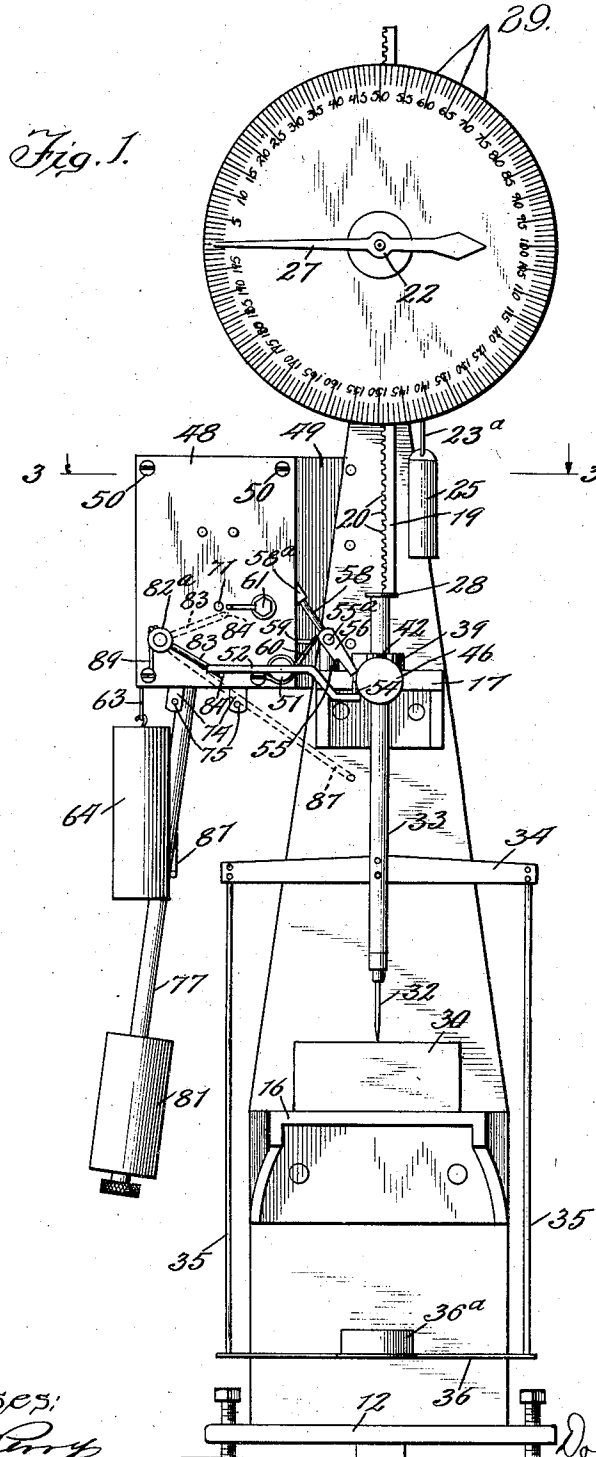


D. RAWSTRON.
PENETRATION MACHINE.
APPLICATION FILED FEB. 2, 1910.

1,062,032.

Patented May 20, 1913.

4 SHEETS—SHEET 1.



Witnesses:
Ed. Perry
S. Lewis.

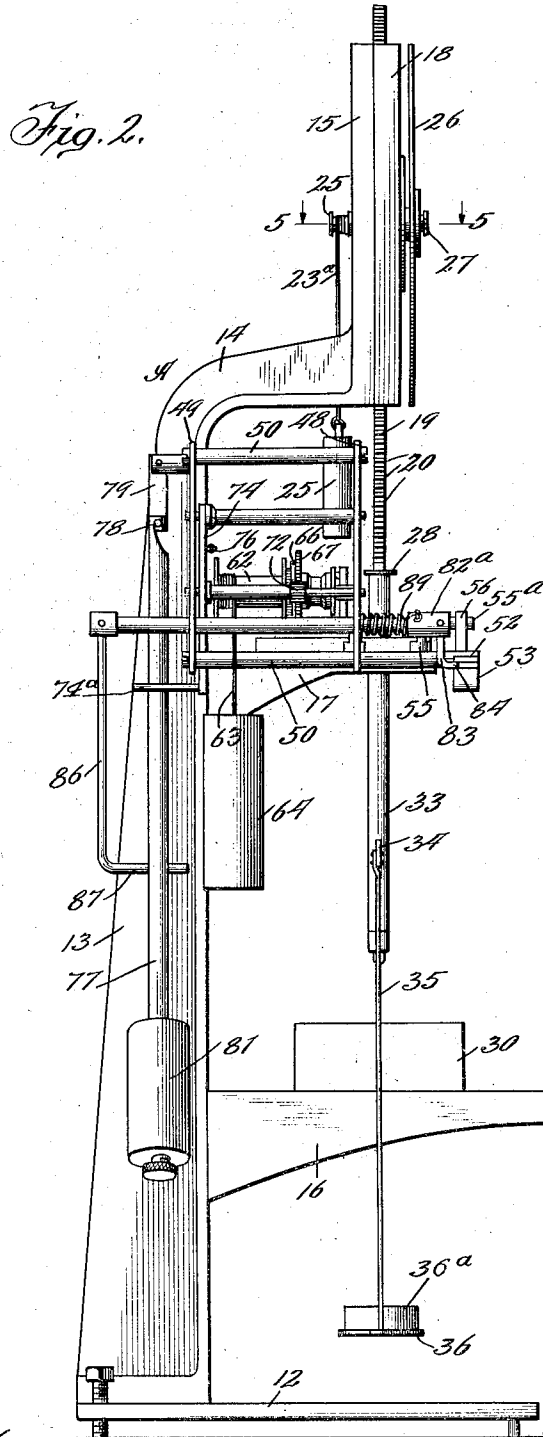
Inventor:
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Attys.

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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

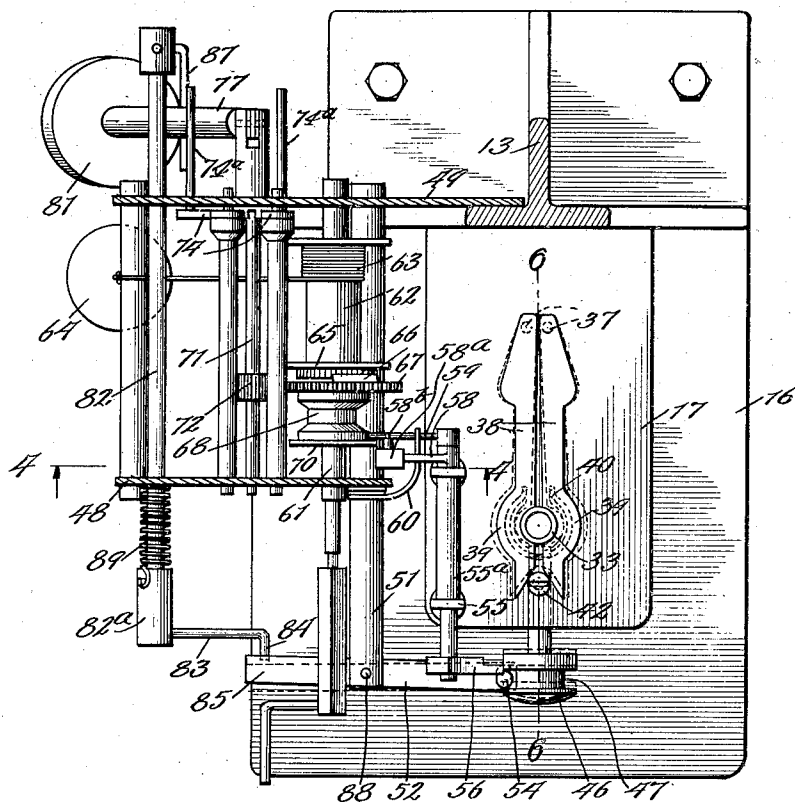


Fig. 3.

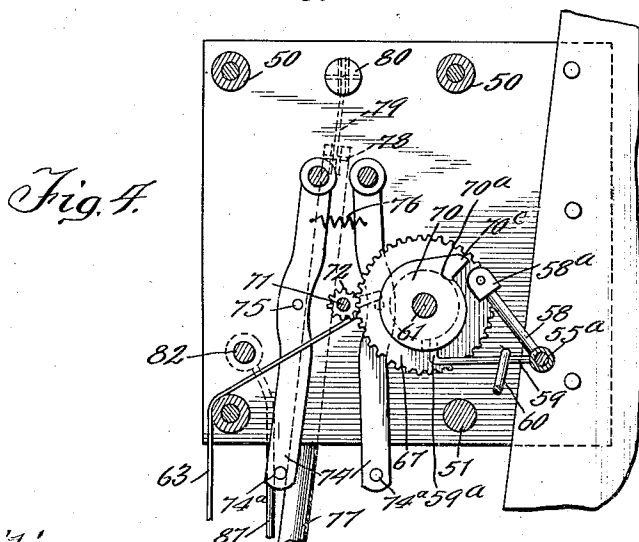


Fig. 4.

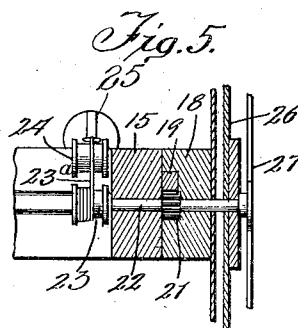


Fig. 5.

Witnesses:
Ed. Perry
D. Lewis.

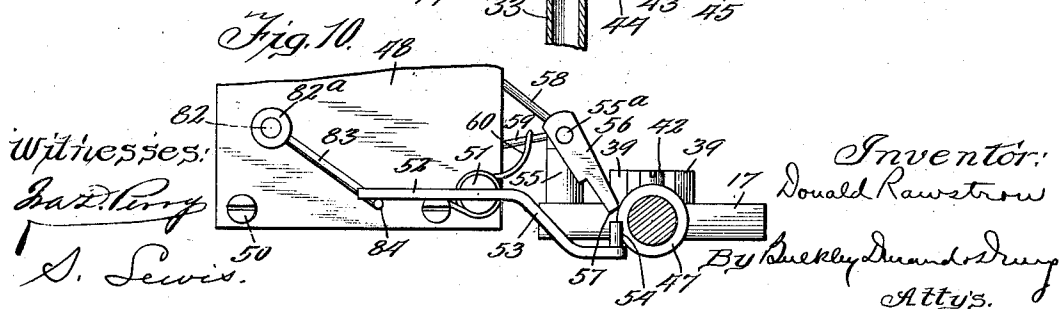
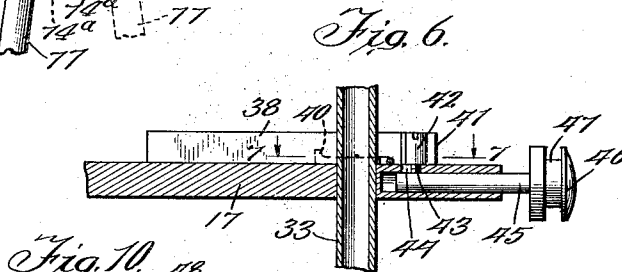
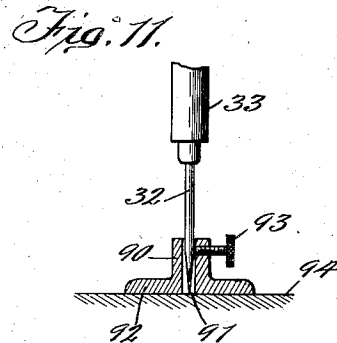
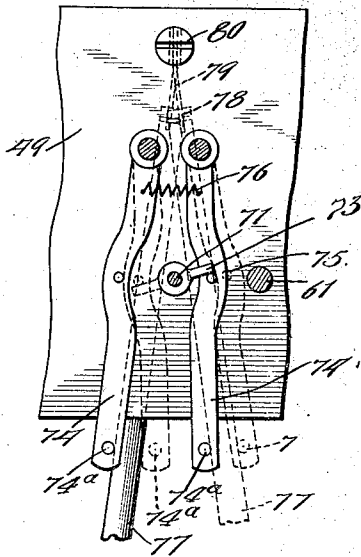
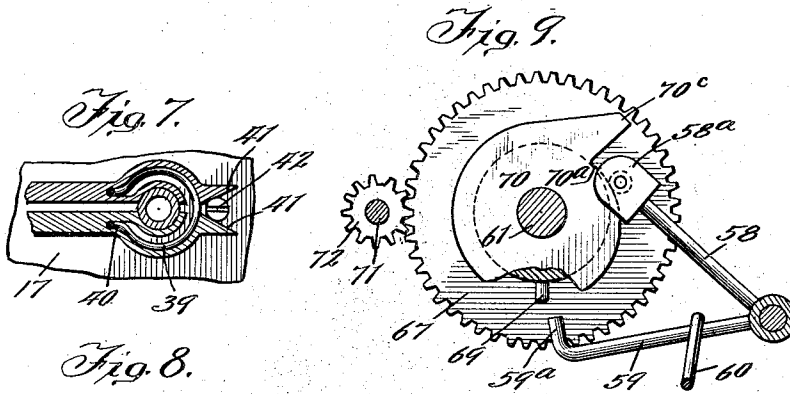
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D. RAWSTRON.
PENETRATION MACHINE.
APPLICATION FILED FEB. 2, 1910.

1,062,032.

Patented May 20, 1913.

4 SHEETS-SHEET 4.



UNITED STATES PATENT OFFICE.

DONALD RAWSTRON, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMERICAN ASPHALTUM AND RUBBER CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PENETRATION-MACHINE.

1,062,032.

Specification of Letters Patent.

Patented May 20, 1913.

Application filed February 2, 1910. Serial No. 541,425.

To all whom it may concern:

Be it known that I, DONALD RAWSTRON, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Penetration-Machines, of which the following is a specification.

My invention relates to improvements in penetration machines, and has for its object the production of a machine in which the penetrator is automatically clamped against further movement at the expiration of a predetermined interval of time.

A further object is the provision of a simple device by the use of which the personal equation of the operator may be disregarded and accurate results obtained. These and such other objects as may hereafter appear are obtained by the use of my device, embodiments of which are illustrated in the accompanying drawings in which:

Figure 1 represents a front elevation of my machine. Fig. 2 represents a side elevation of my machine. Fig. 3 represents a sectional view on the line 3—3 of Fig. 1, looking in the direction indicated by the arrows. Fig. 4 represents a sectional view on the line 4—4 of Fig. 3, looking in the direction of the arrows. Fig. 5 represents a sectional view on the line 5—5 of Fig. 2, looking in the direction of the arrows. Fig. 6 represents a sectional view on the line 6—6, of Fig. 3, looking in the direction of the arrows. Fig. 7 represents a sectional view on the line 7—7 of Fig. 6, looking in the direction indicated by the arrows. Fig. 8 represents an elevation in detail of a portion of Fig. 4. Fig. 9 represents an enlarged view of a portion of Fig. 4. Fig. 10 represents an enlarged view of a portion of Fig. 3. Fig. 11 represents a sectional view of a modification of a portion of my machine.

Like numerals of reference indicate like parts in the several figures of the drawings.

Referring now to the drawings: "A" represents a frame comprising a base 12 and upright 13, curved inwardly at 14 and provided with an upwardly extending dial support 15. Extending outwardly from the frame are a pair of supporting brackets; a lower bracket 16 and an upper bracket 17, the offices of which will be described later.

Mounted in front of the upper member 15 is a guide plate 18, within which is loosely mounted a rack bar 19, the teeth 20 of which

engage the teeth of a pinion 21 on a shaft 22 journaled in the member 15. The shaft 21 terminates in a windlass 23 about which is wound a cord 23^a, passing over an idler 24 and having a weight 25 at its end.

Near the opposite end of the shaft 22 is mounted a dial 26, adapted to be turned by hand, and a pointer 27 is fitted over the end of the shaft and adapted to turn with it.

The lower end of the rack bar terminates in a stop or foot 28, and the dial 26 is divided in a series of divisions as indicated at 29. It will thus be apparent that the vertical movements of the rack bar cause the shaft and pointer to revolve, and thus indicate the extent of travel of the rack bar. The weight 25 is arranged to balance the weight of the rack bar and hold it motionless.

The lower bracket is intended as a support for the material being tested, indicated as 30 in Fig. 1. The needle or penetrator 32 is mounted on the end of needle bar 33, passing through an opening in the upper bracket and adapted to be brought in contact with the foot 28 of the rack bar. The needle bar may be weighted in any manner, as for instance by means of a cross bar 34 from which depend supporting rods 35, passing outside of the lower shelf and connected by weight support 36 on which may be placed any desired weight as 36^a.

Pivotally mounted at 37 on the upper bracket or shelf are a pair of clamping members 38. Near their outer end these members curve outwardly as shown at 39, forming gripping jaws surrounding the opening in the shelf through which the needle bar 33 extends. By means of a spring member 40 the members are normally held as shown in full lines in Fig. 3 and gripping the bar 33, hold it in any desired position.

At their extreme ends the gripping members 38 are cut away, forming diverging faces 41 between which is mounted a stop 42, in this case the head of screw 43 passing through slot 44 in the bracket and engaging a rod or stem 45 fitting within a bore in the bracket. The stem 45 terminates in a circular head 46 a portion of the periphery of which is cut away forming a circumferential groove or channel 47.

When the jaws are in normal position gripping the rod 43 the stop 42 is in the position shown in Fig. 3. When, however, it

is desired to release such grip, the stem 45 is pressed inwardly, the screw sliding within the slot 44 and the jaws are forced apart by the pressure of the head 42 as shown in dotted lines in Fig. 3.

Referring now to the automatic mechanism by means of which the movement of the jaws is regulated: Rigidly secured at the frame adjacent to the upper bracket is an open casing comprising a front plate 48 and a back-plate 49 with corner posts 50 holding the plates together. Extending from the face of the plate 48 is a horizontal supporting bar 51 in a slot, in the end of which is pivotally mounted a flat shifting member 52. This shifting member extends in front of the upper bracket and is curved downwardly at 53 and on the end is mounted a stud 54 adapted to fit at all times within the groove or channel in the head 46.

Mounted in supports 55 on the upper bracket is a short horizontal shaft 55^a, on the outer end of which is mounted a latch 56, the extreme lower end of which 57 is normally out of engagement with the slot 47 when the rod 45 is out and the members 38 in gripping position.

On the opposite or inner end of the shaft 55^a are a pair of diverging engaging fingers 58 and 59. The finger 58 terminates in a head 58^a, from which projects a horizontal stop 58^b and the lower finger 59 is turned upwardly at its end forming a stop 59^a. A spring 60 passes over the member 59 and is secured to the supporting rod 51, and is under tension when the latch 59 is pressed against the outer periphery of the head 46, that is, when the needle holder or support 56 is gripped by the members 38.

The latch 56 is so positioned on the shaft that when the rod 45 is forced inwardly by pressing the head 46, the end of the latch drops within the groove 47, thus releasing the grip on the rod 33 and holding the jaws in open position.

Mounted within the casing adjacent to the members 58 and 59 is an actuated shaft 61 on which is rigidly mounted a windlass or drum 62, on which is wound a cord 63 carrying the weight 64. A pinion 65 is also rigidly mounted on the shaft and engaged by a spring dog 66, carried by a ratchet wheel 67 loosely mounted on the shaft 61.

Projecting from the outer face of the barrel 68 is a pin or stop 69, positioned in line with the stop 59^a. Rigidly mounted on the end of the barrel 68 is a cam 70. This cam has a spiral face commencing at a point 70^a nearest the shaft and terminating in a projecting tooth 70^b, the face of the toothed end of the cam forming a stop 70^c.

Mounted within the casing adjacent and parallel with the shaft 61 is an escapement shaft 71, carrying a pinion 72 engaging the teeth of the ratchet wheel 67, and on the

end of this shaft is a stop 73. Pivotally mounted on the inner face of the plate 49 are a pair of escapement levers 74, provided with pins 75 and adapted to engage the stop 73. A spring member 76 normally holds these levers in closed position. At the lower end these levers are provided with outwardly projecting bars 74^a between which is mounted a pendulum rod 77, removably mounted at 78 in the free end of a spring support 79 secured to the top of the casing at 80. An ordinary pendulum weight 81 is mounted on the end of this rod.

Referring now to the pendulum starting mechanism: A releasing shaft 82 is supported by the plates 48 and 49 and projects from the outer faces thereof. On the outer end 82^a is mounted a stop engaging the member 83, having its end turned at 84 and adapted to engage outer end 85 of the member 52 when the members 38 are in gripping position.

On the opposite end of the shaft 82 is mounted an arm or pendulum support 86, bent at 87 and adapted to engage and hold the pendulum out of perpendicular when the members are in gripping position as indicated above.

It will thus be seen that when the rod 45 is pressed in it rocks the member 52 on its pivot 88 releasing the end 84; a torsion spring 89 is secured to the end 82^a and is so arranged as to hold the shaft under tension when the end 84 is under the member 52, the arm 86 being placed at such an angle that in this position the pendulum is held out of perpendicular by the bent end 67 as shown in Fig. 1. It will thus be seen that when the rod 45 is pushed in the end 84 is released and forced upwardly by the spring 89, the arm 86 is thrown backward permitting the pendulum to swing in the same direction.

In Fig. 11 I have illustrated a needle guide comprising a cylindrical head 90, provided with a bore 91 and a foot or base 92. The bore is larger than the needle 32 thus permitting the needle to move freely therethrough. A binding screw 93 passes through the head 90 and holds the guide on the needle at any desired point. In practice the guide is screwed in position with the point of the needle in line with the bottom of the foot 92. In the event that the top surface 94 of the material is not level, a level place is made for the reception of the guide thus assuring a correct position for the needle before commencing the test.

Referring now to the operation of the machine: Suppose it is desired to test the density or viscosity of a block of asphalt. The sample to be tested 30 is placed on the lower bracket or shaft, the proper weight 37 placed on the support 36 and the point of the needle brought just in contact with

the top of the sample. Where the material is somewhat hard no guide is needed, but in testing softer materials I prefer to use the guide to insure the proper positioning of the needle. The rack bar 19 is then brought down until the foot 28 rests lightly on the top of the needle bar 33; the dial 26 is then revolved until the zero mark thereon registers with the pointer 27. The jaws now grip the bar 33, the shaft 61 is held rigidly by reason of the end 59^a engaging the stop 69 and the pendulum is held out of perpendicular as fully described above. The rod 45 is then pushed in, the screw head 42 pressing the jaws apart and releasing the bar and permitting the needle to commence to penetrate the sample. The pressing inwardly of the bar also releases the stop 84 and starts the pendulum as fully described above. The same movement also pulls the end 59^a out of engagement with the stop, and the beat of the pendulum operates the mechanism and causes the shaft 61 to revolve. Simultaneously with the rocking of the arm throwing the end 59^a out of engagement, the arm 58 is rocked forward and the stop 58^b brought in engagement with the spiral cam at a point near its least diameter. As the swinging of the pendulum revolves the shaft 61 the stop 58^b rests on this cam, and in view of its spiral configuration is being gradually forced backwardly, thus revolving the short shaft 55^a and carrying the arm 59 backwardly and bringing the end 59^a nearer engagement with the stop 69. The gearing is so regulated that on a certain beat, say, in this case, the tenth, the stop 58^b passes over the highest point of the cam at 70^b and the end 59^a again engages the stop 69. At this point the finger is just out of engagement with the groove 47, and the spring clamps 38 force the head 42 out of engagement with their ends and again grip the needle bar 33.

It is evident that during the ten beats of the pendulum the needle has been penetrating the sample and carrying the end of the bar away from the foot 28. The rack bar is now brought down into engagement with the top of the needle bar again and the distance the needle has penetrated the sample is indicated by the movement of the pointer over the face of the dial.

The relation between the rack and pinion of the indicating mechanism is such that a comparatively slight travel of the rack bar causes the pointer to travel over several divisions of the scale, thus assuring an accurate indication of the penetration. Herebefore in penetration devices it has been necessary for an operator to watch the beats of the pendulum, and to manually stop or start the mechanism. In the use of this method it was found that the results obtained by different operators on the same material

would differ materially. This, however, is a known difficulty when the mechanism is regulated by the brain and hand of different individuals. Some, while quick to see, are slow in responding in their muscles to the visual signal, while others are just the opposite and give a muscular signal in advance of the visual signal which is expected but has not yet been received. This tendency on the part of the individual to be slow or fast has resulted in many cases in making it necessary to give each individual whose business it is to receive and record observations, what is termed a personal equation; that is, a very small fractional part of a unit to be added to or subtracted from all results recorded by the individual, depending whether he is slow or fast in the correlation of his subjective and objective faculties. It is in order to avoid unavoidable errors of this kind, as well as those due to the carelessness and inattention of the observers, that my machine is designed, and by its use the personal equation of the individual is entirely eliminated. The operator simply pushes the button and the machine does the rest.

I have shown various mechanisms through the medium of which the desired results may be attained, but I do not limit myself to such specific mechanisms but may use any others without departing from the spirit of my invention.

I claim:—

1. A machine of the class described, comprising a penetrator, a penetrator bar, means for gripping said bar, means for releasing said gripping mechanism, time measuring mechanism, means for setting said time mechanism in operation simultaneously with said releasing mechanism, and means including said time measuring mechanism for causing said gripping mechanism to grip said bar on the expiration of a predetermined interval of time.

2. A machine of the class described, comprising a penetrator, a penetrator bar, means for gripping said bar, means for releasing said gripping mechanism, time measuring mechanism, means for setting said time mechanism in operation simultaneously with said releasing mechanism, means including said time measuring mechanism for causing said gripping mechanism to grip said bar on the expiration of a predetermined interval of time, and means for measuring the length of travel of said penetrator.

3. A machine of the class described, comprising a penetrator, a penetrator bar, means for applying various weights thereto, means for gripping said bar, means for releasing said gripping mechanism, time measuring mechanism, means for setting said time mechanism in operation simultaneously with said releasing mechanism, means in-

cluding said time measuring mechanism for causing said gripping mechanism to grip said bar on the expiration of a predetermined interval of time, and means for measuring the length of travel of said penetrator.

4. A machine of the class described, comprising a penetrator, a penetrator bar, means for gripping said bar, means for releasing said gripping mechanism, time measuring mechanism, means for automatically setting said time mechanism in operation simultaneously with said releasing mechanism, and means including said time measuring mechanism for causing said gripping mechanism to grip said bar on the expiration of a predetermined interval of time.

5. A machine of the class described, comprising a penetrator, a penetrator bar, means for gripping said bar, means for releasing said gripping mechanism, time measuring mechanism, means for setting said time mechanism in operation simultaneously with said releasing mechanism, and means including said time measuring mechanism for automatically causing said gripping mechanism to grip said bar on the expiration of a predetermined interval of time.

6. A machine of the class described, comprising a penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, grip releasing mechanism; a pendulum, means whereby the operation of said grip releasing mechanism simultaneously starts said pendulum, means actuated by said pendulum whereby said gripping means are set into operation on the expiration of a predetermined number of beats of said pendulum.

7. A machine of the class described, comprising a penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, grip releasing mechanism; a pendulum, means whereby the said operation of said grip releasing mechanism simultaneously starts said pendulum, means actuated by said pendulum whereby said gripping means are set into operation on the expiration of a predetermined number of beats of said pendulum, and means for measuring the travel of said penetrator.

8. A machine of the class described, comprising a penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, grip releasing mechanism; a pendulum, means for holding said pendulum out of perpendicular, means automatically operable by grip releasing mechanism for withdrawing said pendulum, holding means thereby permitting said pendulum to oscillate, means actuated by said pendulum whereby said gripping means are set into operation on the ex-

piration of a predetermined number of beats of said pendulum.

9. A machine of the class described, comprising a penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, grip releasing mechanism; a pendulum, means for holding said pendulum out of perpendicular, spring means automatically operable by grip releasing mechanism for withdrawing said pendulum holding means thereby permitting said pendulum to oscillate, means actuated by said pendulum whereby said gripping means are set into operation on the expiration of a predetermined number of beats of said pendulum.

10. A machine of the class described, comprising a penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, spring actuated grip releasing mechanism; a pendulum, means whereby the said operation of said grip releasing mechanism simultaneously starts said pendulum, means actuated by said pendulum whereby said gripping means are set into operation on the expiration of a predetermined number of beats of said pendulum.

11. A machine of the class described, comprising a penetrator, means for varying the weight of said penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, grip releasing mechanism, a pendulum, means whereby the operation of said grip releasing mechanism simultaneously starts said pendulum, means actuated by said pendulum whereby said gripping means are set into operation on the expiration of a predetermined number of beats of said pendulum.

12. A machine of the class described, comprising a penetrator, means for varying the weight of said penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, grip releasing mechanism; a pendulum, means for holding said pendulum out of perpendicular, means automatically operable by grip releasing mechanism for withdrawing said pendulum holding means thereby permitting said pendulum to oscillate, means actuated by said pendulum whereby said gripping means are set into operation on the expiration of a predetermined number of beats of said pendulum.

13. A machine of the class described, comprising a penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, grip releasing mechanism; a pendulum, means

whereby the operation of said grip releasing mechanism simultaneously starts said pendulum, means actuated by said pendulum whereby said gripping means are set into
5 operation on the expiration of a predetermined number of beats of said pendulum, and means for measuring the distance of travel of said penetrator.

14. A machine of the class described,
10 comprising a penetrator, means for varying the weight of said penetrator, means for supporting the material to be treated in operative position, gripping means for holding said penetrator in any desired position, grip
15 releasing mechanism, a pendulum, means for holding said pendulum out of perpendicular, means automatically operable by grip releasing mechanism for withdrawing said pendulum holding means thereby permitting
20 said pendulum to oscillate, means actuated by said pendulum whereby said gripping means are set into operation on the expiration of a predetermined number of beats of said pendulum, and means for measuring
25 the distance of travel of said penetrator.

15. A machine of the class described, comprising a frame, an upper and a lower bracket mounted thereon, a penetrator, grip-
30 ping means carried by the upper bracket for gripping said penetrator, said lower bracket being adapted to receive material to be tested, means carried by said upper bracket for releasing said mechanism; a pendulum

mounted on said frame, means whereby the release of said gripping means automatically
35 causes said pendulum to oscillate, means interposed between said pendulum and gripping means whereby at the expiration of a predetermined number of beats the downward movement of said penetrator is auto-
40 matically checked and means for recording the distance of travel of said penetrator.

16. A machine of the class described, comprising a frame, an upper and a lower bracket mounted thereon, a penetrator, grip-
45 ping means carried by the upper bracket for gripping said penetrator, said lower bracket being adapted to receive material to be tested, means carried by said upper bracket for releasing said mechanism, a pendulum
50 mounted on said frame, means whereby the release of said gripping means automatically causes said pendulum to oscillate, a train of gears and system of levers interposed between said pendulum and gripping means
55 whereby at the expiration of a predetermined number of beats the downward movement of said penetrator is automatically checked, and means for recording the distance of travel of said penetrator.
60

Signed by me at Chicago, Illinois, this
27th day of January, 1910.

DONALD RAWSTRON.

Witnesses:

WM. B. McWINION,
E. H. CLEGG.