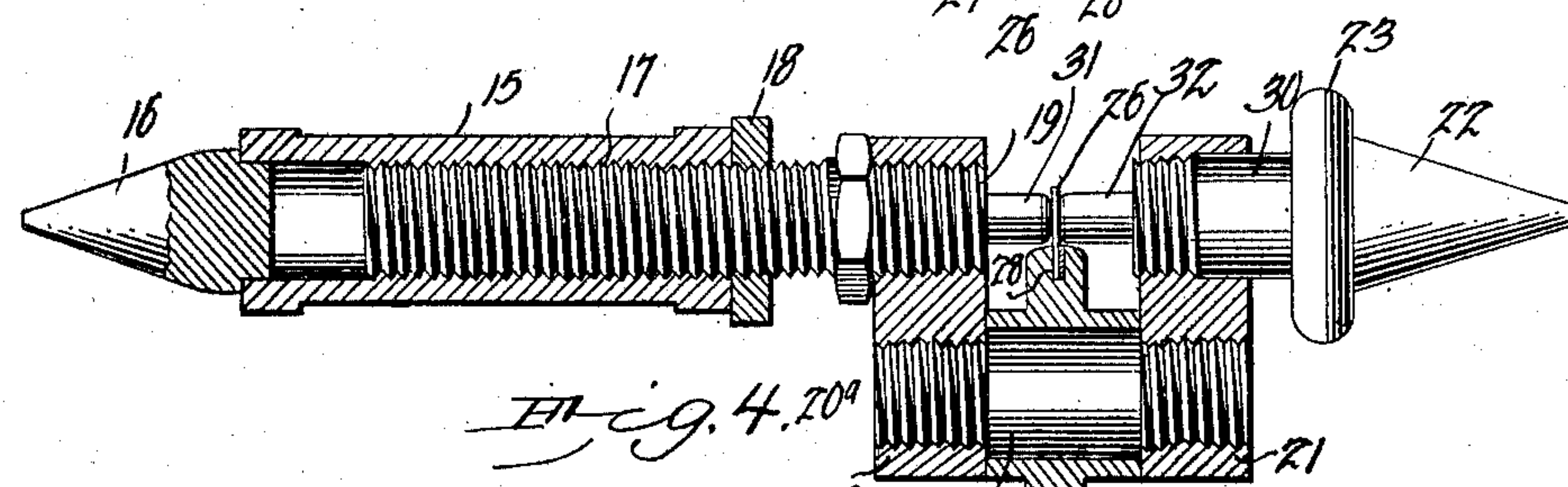
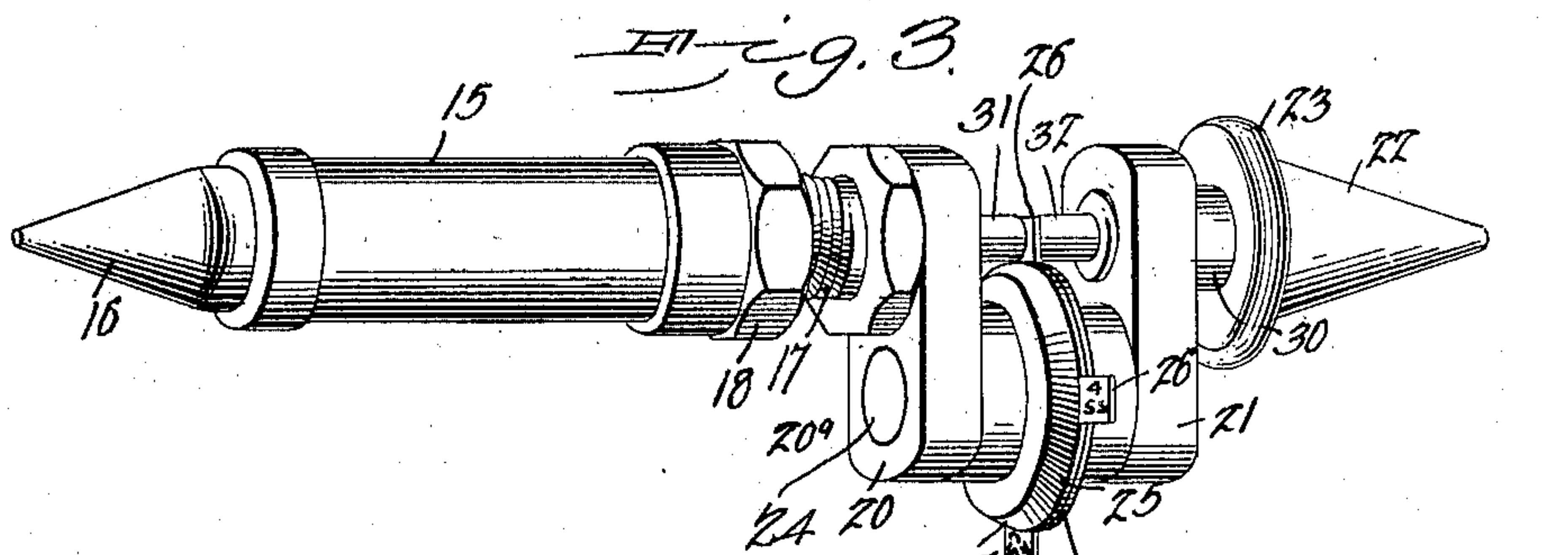
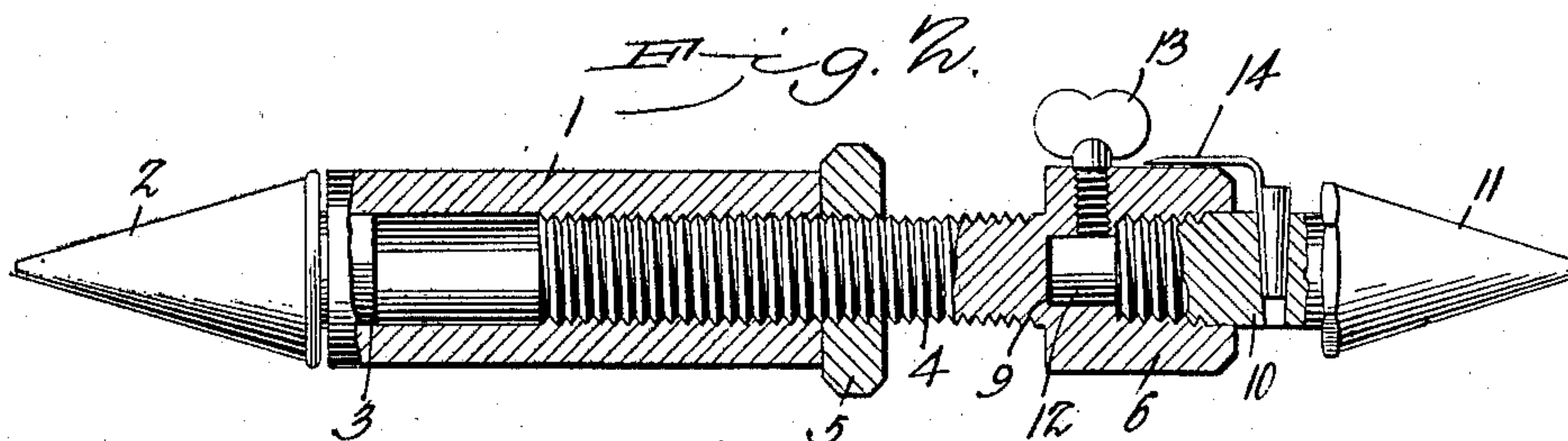
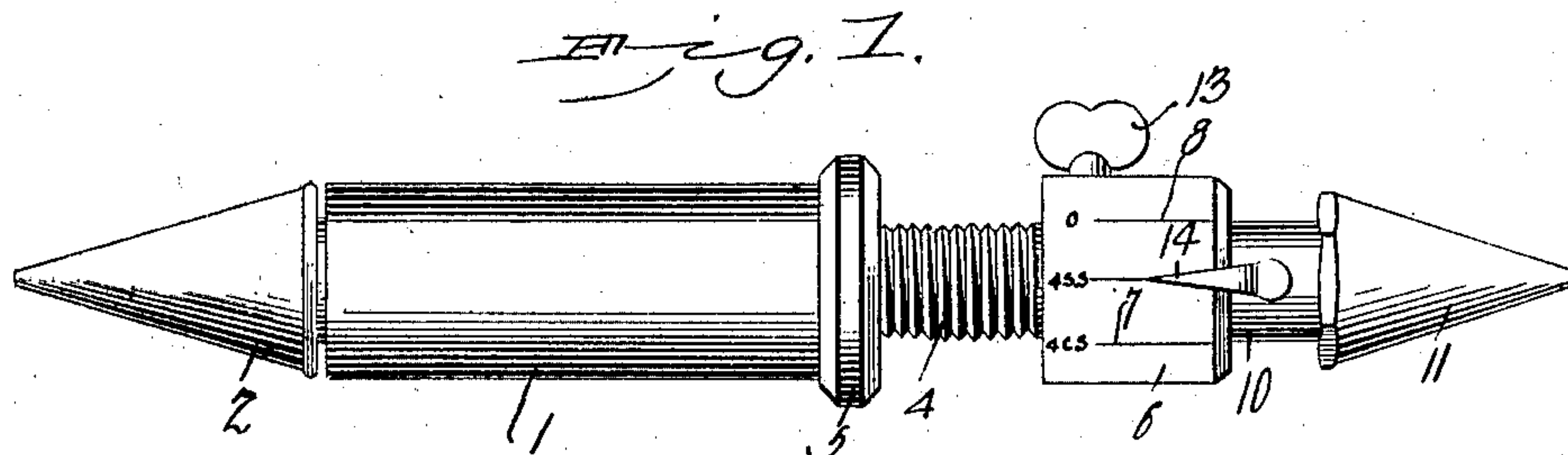


No. 746,622.

PATENTED DEC. 8, 1903.

A. J. WOLD.
SLIP AND SHRINKAGE GAGE.
APPLICATION FILED SEPT. 13, 1902.

NO MODEL.



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UNITED STATES PATENT OFFICE.

ANTON JORGEN WOLD, OF RICHMOND HILL STATION, NEW YORK.

SLIP AND SHRINKAGE GAGE.

SPECIFICATION forming part of Letters Patent No. 746,622, dated December 8, 1903.

Application filed September 13, 1902. Serial No. 123,300. (No model.)

To all whom it may concern:

Be it known that I, ANTON JORGEN WOLD, a citizen of the United States, residing at Richmond Hill Station, in the county of Queens and State of New York, have invented a new and useful Slip and Shrinkage Gage, of which the following is a specification.

This invention relates to slip and shrinkage gages.

The object of the invention is in a ready, simple, thoroughly feasible, practical, and positive manner without the employment of tables of measurements setting forth the different coefficients of expansion of like and unlike metals to be united or the careful setting of the instrument to finely-divided scale or graduations designating standard divisional parts of an inch to effect accurate measurements of increments of diameters necessary where round bodies are to be forced into bores under hydraulic pressure or where they are to be shrunk upon each other.

With these and other objects in view, as will appear as the nature of the invention is better understood, the same consists, generally stated, in a slip and shrinkage gage having means to indicate the coefficients of expansion and contraction of metals.

The invention consists, further, in a slip and shrinkage gage having means to indicate the different coefficients of expansion and contraction of like or unlike metals to be united.

The invention consists, further, in the novel construction and combination of parts of a slip and shrinkage gage, as will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification, and in which like numerals of reference indicate corresponding parts, there are illustrated two forms of embodiment of the invention, each capable of carrying the same into practical operation, it being understood that the elements therein exhibited may be varied or changed as to shape, proportion, and exact manner of assemblage without departing from the spirit thereof, and in these drawings—

Figure 1 is a view in side elevation of one form of embodiment of the invention. Fig. 2 is a view in vertical longitudinal section through a portion of the same. Fig. 3 is a view in perspective of another form of the

invention. Fig. 4 is a view in vertical longitudinal section through the same.

Before describing this invention it might be well to state at the outset in order to render clear an understanding of the present device and to define it from the art that the scales or graduation-marks universally employed in connection with gages of this character to indicate measurements are spaced into standard fractional parts of an inch, so that without thorough prior knowledge of the different coefficients of expansion and contraction of the same or different metals that are to be associated either by hydraulic pressure or by shrinkage, and in the absence of tables of measurements provided for the purpose, such gages will be valueless as an aid to indicate the allowance to be made to effect the proper assemblage of parts by such procedures. Furthermore, as metals do not expand and contract in a fixed and predetermined ratio corresponding to standard divisional parts of an inch the graduated scales usually employed cannot always be utilized, it being necessary that the judgment of the workman be relied upon to effect the proper setting of the gage. For example, suppose the scale be divided into graduations representing eighths, sixteenths, thirty-seconds, and so on, of an inch, or tenths, twentieths, and so on, of an inch. If the coefficient of expansion be between such graduations—as, for instance, a seventeenth part of an inch or a fifteenth part of an inch—it will be seen that the scale provided will be practically useless in determining exact measurements, and without the exercise of the greatest possible care and skill on the part of the workman mistakes under such conditions are more than likely to occur.

With the gage of the present invention the graduation parts or gaging or calipering elements do not represent fractional parts of an inch, but the amount of contraction and expansion of the same or different metals, which amount is dependent upon the size of an article and upon the coefficients of expansion and contraction of the metal or metals of which the article is made, which are obtained from practical tests and are established as to accuracy, and the indicating-figures employed in connection with the elements denote the

diameters of the openings to which such elements obtain. For example, suppose it be desired to shrink or to slip by hydraulic pressure a cast-iron car-wheel on a four-inch steel axle. The diameter of the axle being known, the gage will be set to four inches minus the allowance for expansion or contraction, as the case may be, and at a point indicating the two metals named, and the size of the opening to be bored in the axle will thus be positively given. If the parts to be assembled are of the same metal, such as steel, then the gage would have to be differently adjusted, owing to the difference in the coefficient of expansion of steel as compared with those of steel and cast-iron. It will be seen, therefore, that the gage of this invention dispenses with the necessity of any prior knowledge of allowances requisite in assembling metallic parts in the manner defined and also with the employment of tables exhibiting the required measurements for the purpose, the result being that absolute accuracy in workmanship is secured, provided, of course, that the gaging or calipering elements are properly constructed.

Referring to the drawings and to Figs. 1 and 2 thereof, 1 designates a tubular body having detachably associated therewith at one end a fixed point 2. The body may be of any desired length, and in practice a plurality of these bodies of different lengths will be furnished with each gage in order to extend its range of usefulness and to adapt it for measuring internal diameters from a few inches up to many feet. The point 2 is herein shown as provided with a reduced teat 3, adapted by frictional contact with the walls of the bore of the body to be held in operative position; but it is to be understood that if preferred it may have a threaded engagement with the body and still be within the scope of the invention. The bore of the body is threaded for a portion of its length for the reception of a threaded shank 4, which is adapted to be locked at any desired adjustment with relation to the body by a jam-nut 5. The shank has associated with its free end, either integrally or detachably, a head 6, the periphery of which bears graduation-marks 7, of which there may be any desired number, the measuring values of which are determined by symbols, such as "4 SS" "4 CS," the numeral indicating the diameter of the hole or opening to which the measurement obtains and the letters the character of the two metals to be assembled. Thus "4 SS" indicates that the diameter of the opening is four inches and that the metals to be assembled are both of steel, while "4 CS" indicates that the diameter of the opening is four inches and that the metals to be assembled are of cast iron and steel. The head is also provided with a zero graduation-mark 8, from which measurements will all initially start. A description is herein given of but two measurements, this being sufficient to explain the manner in which this

device operates; but it is to be understood that the head may be graduated up to as many inches or feet as may be desired, and as this will be readily understood detailed illustration is deemed unnecessary.

The head is provided with a threaded bore terminating in an unthreaded reduced socket 9 and the bore is engaged by the threaded stem of an adjustable point 11, the inner end of the stem being provided with an unthreaded teat 12 to engage the socket 9. The head carries a set-screw 13, the inner end of which is adapted to be turned into engagement with the teat 12, thus to lock the adjustable point at the adjustment desired.

The stem has associated with it in any preferred manner a pointer or indicator 14, adapted in the usual manner to coact with the graduation-marks 7 in determining measurements. It is preferred in practice that the teat 12 shall bear against the end wall of the socket 9 when the pointer or indicator is in exact alinement with the zero graduation-mark, thus to facilitate accurate setting of the gage.

The manner of using the form of gage just described is as follows: Suppose it be desired to assemble a car-wheel and an axle the wheel having a four-inch axle-opening and both of the parts being of steel. Under these conditions the adjustable point will be set with the indicator 14 in alinement with the zero-mark 8 and will be secured in this position by the set-screw 13. The body will then be turned upon the threaded shank 4 until the distance between the terminals of the two points is exactly four inches, this being determined by the employment of a pair of outside calipers which have been accurately set to this measurement, and the jam-nut 5 will then be operated to lock the parts in their adjusted position. The set-screw 13 will then be released and the pointer moved to the mark "4 SS" on the head and will again be secured in this adjustment by the set-screw. In turning the head from the zero-mark to the graduation-mark "4 SS" the length of the gage is increased, and this added length will be the exact allowance that will be necessary to effect assemblage of the parts by shrinkage or by pressure and will show exactly how much larger than the hole in the axle the axle is to be made. The reverse of this operation will take place should it be desired to fit a car-wheel on a four-inch axle. Under these conditions, assuming that both of the parts are of steel, the indicator will be moved to the mark "4 SS" and secured there, and the gage will be adjusted to exactly four inches in length, after which the pointer will be moved to the zero graduation-mark, thereby shortening the length of the gage, and this decrease in its length will show exactly how much smaller than the axle the hole in the wheel is to be made.

In the form of embodiment of the invention shown in Figs. 3 and 4 the body 15 and fixed point 16 are substantially the same as

those already described. The shank 17 is also threaded into the body and is held at the desired adjustment by a jam-nut 18. The outer end of the shank is threaded at 19 for engagement by one member 20 of the head 20^a, the other member 21 of which has connected with it by a threaded connection the adjustable point 22, which is preferably provided with a shoulder 23, by which to permit of its being turned. The two members 20 and 21 of the head have their free terminals connected by a bolt 24, the extremities of which are threaded to engage threaded opening in the terminals of the said members, the intermediate portion of the bolt being smooth to constitute a bearing for a gage-wheel 25, with which are associated the gaging or calipering elements, comprising a plurality of arms 26 of different thicknesses, corresponding to the coefficient of expansion and contraction of the metals to be assembled. The arms are connected with the wheel in this instance by providing the latter with a peripheral shoulder 27, having a circumferential groove 28, in which the ends of the arms are seated, and are held therein by any suitable fastening device, in this instance by means of wedges 29, the use of the latter permitting removal of the arms when desired. The opposing ends of the shank 17 and the stem 30 of the adjustable point 22 are each provided with a reduced projection 31 and 32, respectively, which are disposed in alinement and constitute caliper-points to coact with the gaging elements in effecting measurements. In the use of this last-described form of gage, say in determining how much smaller than the axle the hole of a wheel must be to permit proper assemblage of the parts, the following procedure obtains: Assuming the axle to be four inches in diameter, the adjustable point 22 will be turned to separate the caliper-points 31 and 32, and the gage-wheel will then be moved to bring the arm or gaging element 26 of the proper thickness between the caliper-points, after which the adjustable point is turned to clamp the said points tightly against the arm. The body is now adjusted until the distance between the points 16 and 22 is exactly four inches, whereupon the jam-nut will be turned to lock the parts securely together. The adjustable point is now loosened and the gage-wheel is turned to move the arm 26 from between the caliper-points 31 and 32, after which the said adjusting-point is again turned to bring the caliper-

points into engagement. The difference between the length of the gage when thus set as compared with its adjusted length of four inches will be exactly the amount of shrinkage to allow.

It will be seen from the foregoing description that although the devices of this invention are exceedingly simple of construction they will be found thoroughly efficient and practical in use for the purposes designed and may be relied upon for accomplishing accurate work.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A slip and shrinkage gage comprising a body having a fixed point, a shank adjustably connected with the body and having a head bearing graduation-marks indicating different coefficients of expansion and contraction of like or unlike metals, an adjustable point associated with the head and carrying a pointer to coact with the graduation-marks, and means for locking said point at any desired adjustment.

2. A slip and shrinkage gage comprising a body having a fixed point, a shank adjustably connected with the body and having a head bearing graduation-marks indicating different coefficients of expansion and contraction of like or unlike metals, an adjustable point carried by the head and provided with a pointer to coact with the graduation-marks, and means for locking the latter point at any desired adjustment.

3. A slip and shrinkage gage comprising a body having a fixed point and provided with interior threads, a shank engaging the threads and provided with a head having graduation-marks to indicate different coefficients of expansion and contraction of like or unlike metals, a jam-nut carried by the shank for locking it with relation to the body, an adjustable point carried by the head and provided with a pointer to coact with the graduation-mark, and means carried by the head for locking the latter point at any desired adjustment.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ANTON JORGEN WOLD.

Witnesses:

JOSEPH BLEES,
WM. H. GILLIES.